THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXVI. No. 2138.] LONDON, MAY 3, 1904. [56TH YEAR. PRICE 6d.

PARKER & LESTER,

— *ESTABLISHED 1830.* —

MANUFACTURERS AND CONTRACTORS, **ORMSIDE STREET, LONDON, S.E.**

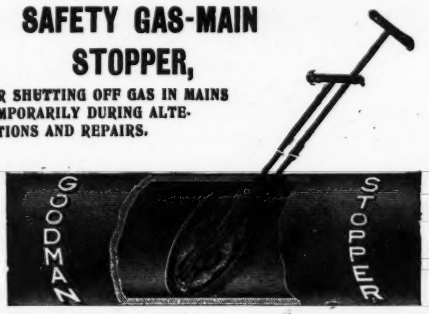
THE ONLY MAKERS OF

PATENT ANTIMONY PAINT & PARKER'S IMPERIAL BLACK VARNISH.

OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

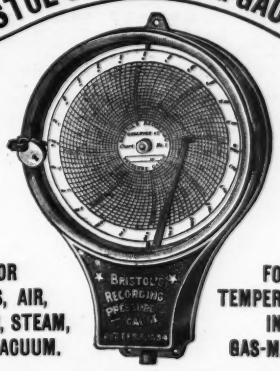
FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.



GAS-LEAK INDICATOR.

PRICES AND PARTICULARS ON APPLICATION.

BRISTOL'S RECORDING GAUGES

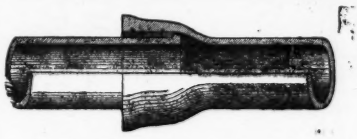


FOR GAS, AIR, WATER, STEAM, OR VACUUM.

FOR TEMPERATURE IN GAS-MAINS.

Many Thousands in Daily Operation.

J. W. & C. J. PHILLIPS,
23, COLLEGE HILL,
LONDON, E.C.



Diameters 1¼ in. to 78 in.

VERTICALLY CAST IRON PIPES.

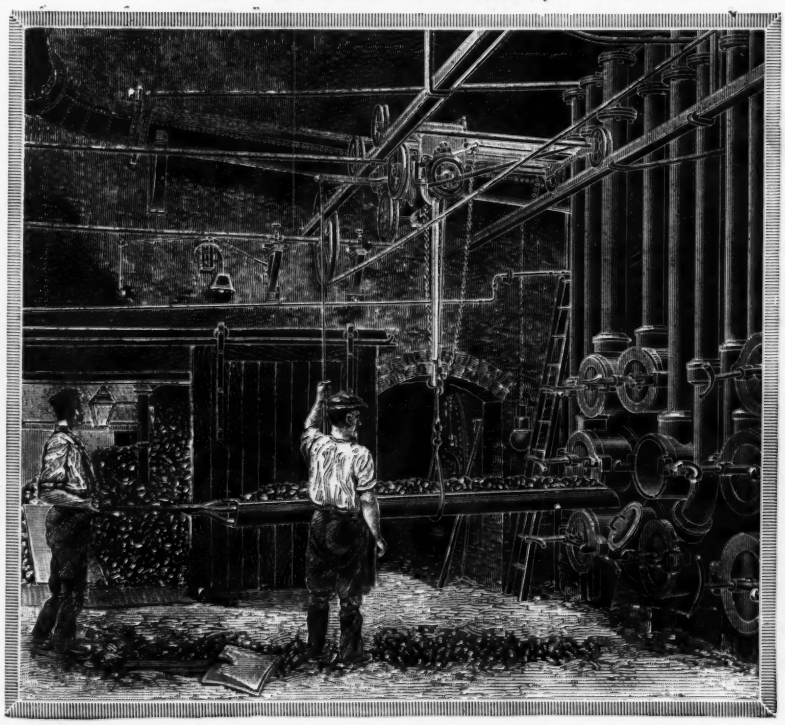
The only Foundry in Europe casting Pipes under Clarifying Process.

A. G. CLOAKE, 54, Holborn Viaduct, London, E.C.

Telegrams: "AMOUR, LONDON." Telephone Nos.: 1890 HOLBORN; CENTRAL 194.

BIGGS, WALL, & CO.,

13 CROSS STREET, FINSBURY LONDON, E.C.



Telegrams: "RAGOUT, LONDON."
Telephone: 273 CENTRAL.

"RAPID"
MANUAL & POWER
CHARGING APPARATUS,
FOR GAS-WORKS OF ALL SIZES.

Repeat Orders
YEOVIL, NEWPORT, SOUTHBANK, WORTHING, ALDERSHOT.

Machines can be seen working at any of the following Works:—

ALDERSHOT	WREXHAM
WORTHING	SWINDON
YEOVIL	EPSOM
TRURO	SHETTLESTON
NORMANTON	DUBLIN
OTLEY	G. S. & W. Rly. Works
GOOLE	NEWPORT, MON.

GANDY'S BELTING

Holds the World's Record! 41 Prize Awards!

IN A WATER-GAS PLANT, an important item is the Belt for driving the Blower. Ours are specially constructed **Endless Belts,** and have acquired a reputation for this special Work.

CONVEYOR BELTING—A SPECIALITY.

THE GANDY BELT MANUFACTURING COMPANY, LTD.,

HEAD OFFICES AND WORKS—**SEACOMBE, LIVERPOOL.**

This Trade Mark may be seen stencilled on every genuine "Gandy" Belt.

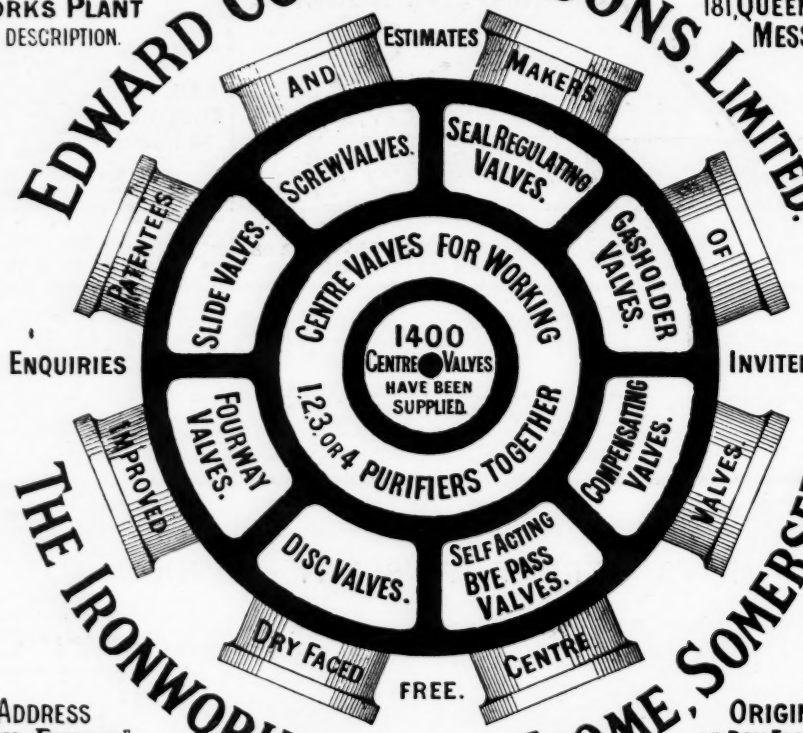
PATENT ADJUSTABLE OVERFLOWS.

ENGINEERS & CONTRACTORS FOR GAS WORKS PLANT OF EVERY DESCRIPTION.

LONDON OFFICE: BRIDGE HOUSE 181, QUEEN VICTORIA ST. E.C. MESSRS. BALE & HARDY, AGENTS.

PATENT WASHERS

PATENT COMBINED BYE-PASS & COMPENSATOR FOR EXHAUSTERS.



TELEGRAPHIC ADDRESS "COCKEYS FROME" "DAMPER LONDON"

ORIGINAL MAKERS OF DRY-FACED CENTRE VALVES. ESTABLISHED OVER HALF A CENTURY.

PATENT FIRE DOORS & FRAMES.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

ABERCORN FOUNDRY AND ABBEY WORKS,

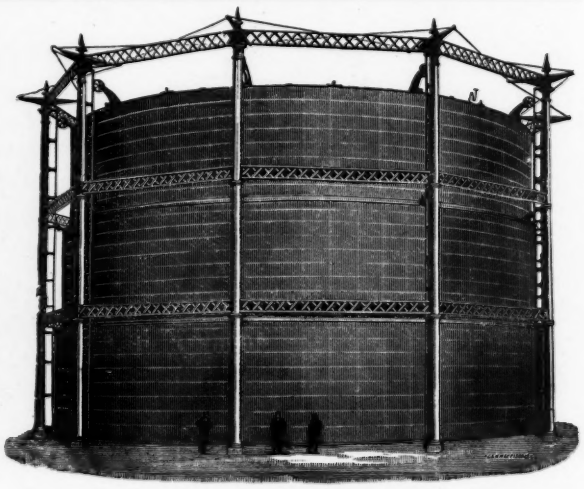
PAISLEY, N.B.,

MAKERS OF

Gasholders & Gas Plant

OF EVERY DESCRIPTION.

Telegraphic Address: "Donald, Paisley."



THE BARROWFIELD IRON-WORKS, LTD.,

GAS ENGINEERS AND CONTRACTORS,

Telegrams:
"GASOMETER, GLASGOW."

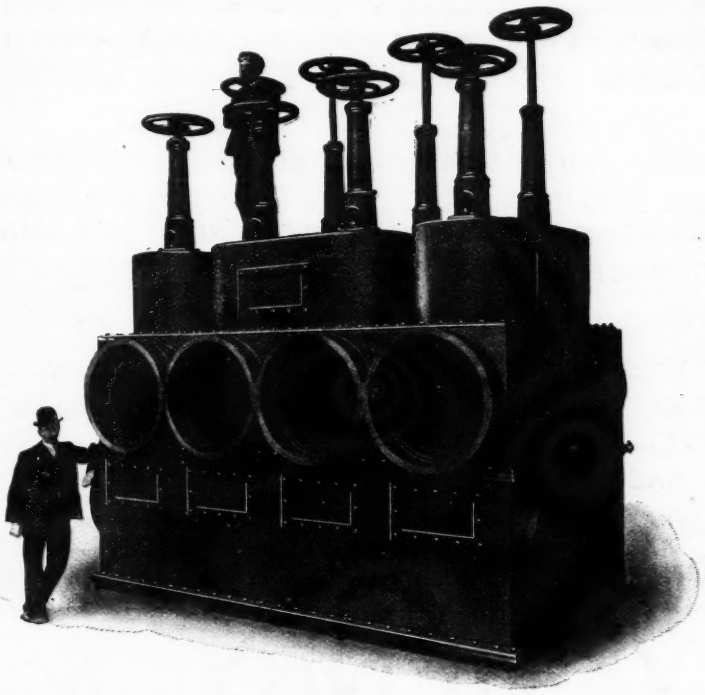
OIL PLANT AND CHEMICAL APPARATUS.

BRIDGES, GIRDERS, WHARVES, PIERS.

ROOFING OF EVERY STYLE.

PIPES, VALVES, AND CONNECTIONS.

London Office:
6, LITTLE BUSH LANE, CANNON STREET, E.C.



Weck's Centre-Valve for 30-inch Connections for GRANTON GAS-WORKS of the EDINBURGH and LEITH CORPORATIONS GAS COMMISSIONERS.

GLASGOW.

GAS APPARATUS OF EVERY DESCRIPTION.

RETORTS, CONDENSERS, SCRUBBERS, PURIFIERS.

GASHOLDERS AND TANKS.

ENGINES, EXHAUSTERS, STEAM-BOILERS, AND FITTINGS.

GEORGE ORME & CO. (Branch of Meters Ltd.)

ATLAS METER WORKS,

Tel. Address: "ORME OLDHAM."
Telephone No. 93 Oldham.

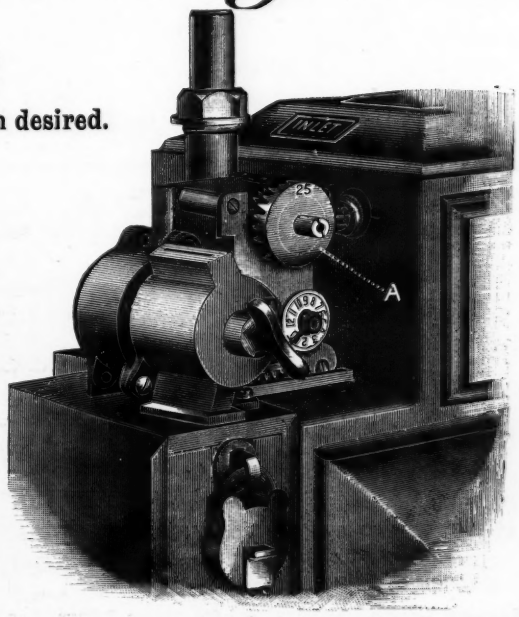
PARK STREET, OLDHAM.

"NEW CENTURY" PATTERN

Patent Coin Prepayment Gas-Meters

Fitted with Detachable Attachments.

Arranged for 1d., 1s., or any other Coin desired.



Change of Price effected by simply removing Crown Wheel "A" and replacing same with another Wheel.

ANY FURTHER PARTICULARS WILL BE SUPPLIED UPON APPLICATION.

NEWTON, CHAMBERS, & CO.,

LIMITED,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

Established 1790

LONDON OFFICE: 19, Great George Street, WESTMINSTER.

Telegraphic Addresses: "NEWTON, SHEFFIELD," "ACCOLADE, LONDON."

GAS ENGINEERS IRONFOUNDERS, & CONTRACTORS.

MANUFACTURERS OF EVERY DESCRIPTION OF

PLANT, APPARATUS, AND MACHINERY FOR GAS AND CHEMICAL WORKS.
RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT CONVEYORS AND ELEVATORS.
CONDENSERS, SCRUBBERS, AND WASHERS.

PURIFIERS with Planed Joints a Speciality.

PATENT CENTRE-VALVES, RACK AND SCREW VALVES, WOOD GRIDS AND SCRUBBER-BOARDS, CAST-IRON MAINS, AND SPECIALS.
STRUCTURAL WORK, COLUMNS, GIRDERS, AND ROOFING.
GASHOLDERS CAST-IRON OR STEEL TANKS.

DESIGNS, SPECIFICATIONS, and ESTIMATES FREE.

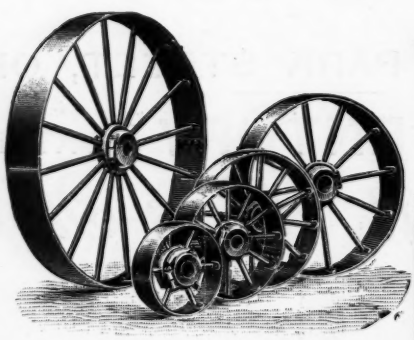
PIG IRON (SPECIAL QUALITY) for Engine Cylinders. GAS COAL famous for its unrivalled excellence.

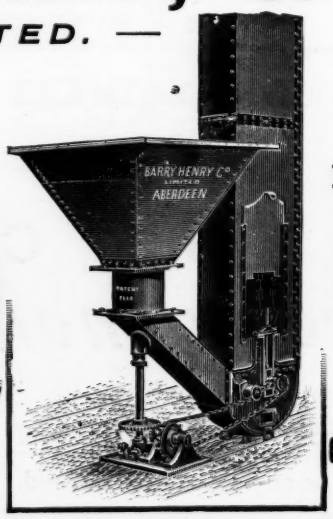
BARRY, HENRY, & CO.,

— *LIMITED.* —

Specialities:
TRANSMISSION OF POWER.
Rope & Belt Pulleys,
Spur & Bevel Wheels,
Shafting & Couplings,
Pedestals, & Fixings.

WORKS:
ABERDEEN,
SCOTLAND.





Specialities:
TRANSMISSION OF MATERIALS.
Conveyors
Elevators,
Grinding Machinery,
Motors.

AND
64, MARK LANE,
LONDON, E.C.

JOSEPH EVANS & SONS,

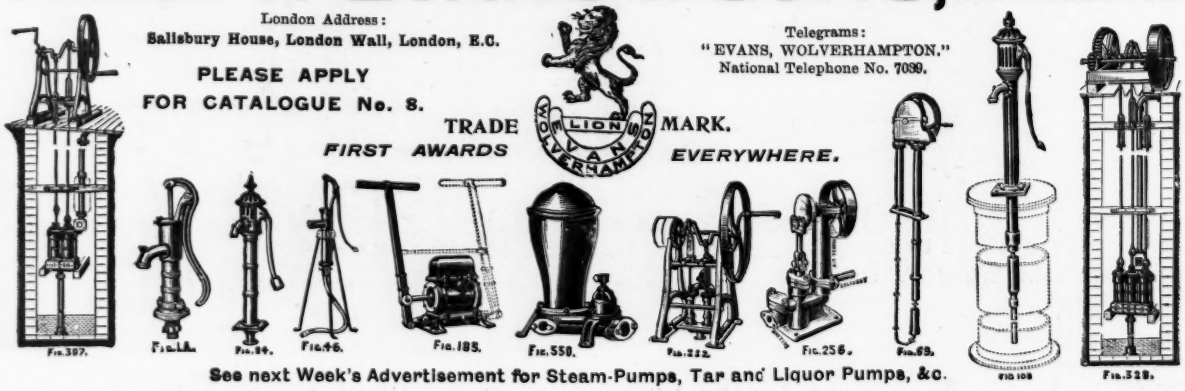
CULWELL WORKS, WOLVERHAMPTON.

London Address:
Salisbury House, London Wall, London, E.C.

PLEASE APPLY FOR CATALOGUE No. 8.

Telegrams:
"EVANS, WOLVERHAMPTON."
National Telephone No. 7099.

TRADE MARK.
FIRST AWARDS *EVERYWHERE.*

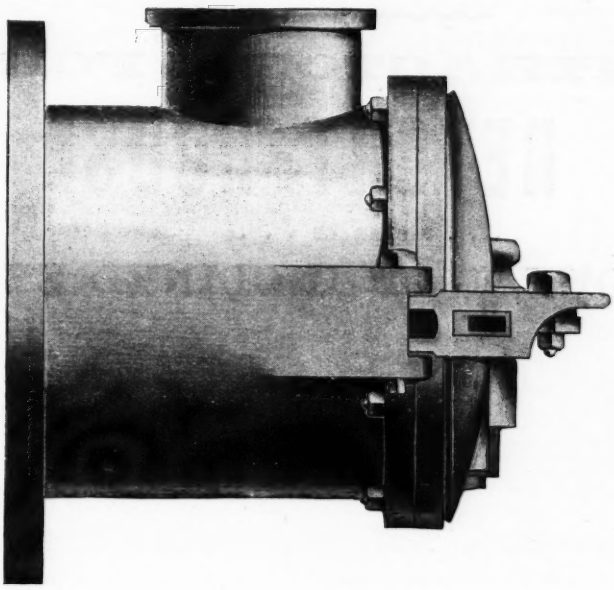


See next Week's Advertisement for Steam-Pumps, Tar and Liquor Pumps, &c.

THE WHESSOE FOUNDRY CO., LTD.

Works: DARLINGTON.

MAKERS OF EVERY DESCRIPTION OF GAS PLANT.



CHANDLER'S

(PATENT)

"DETACHABLE FACE MOUTHPIECE"

Steel, Malleable, or Cast-Iron Face.

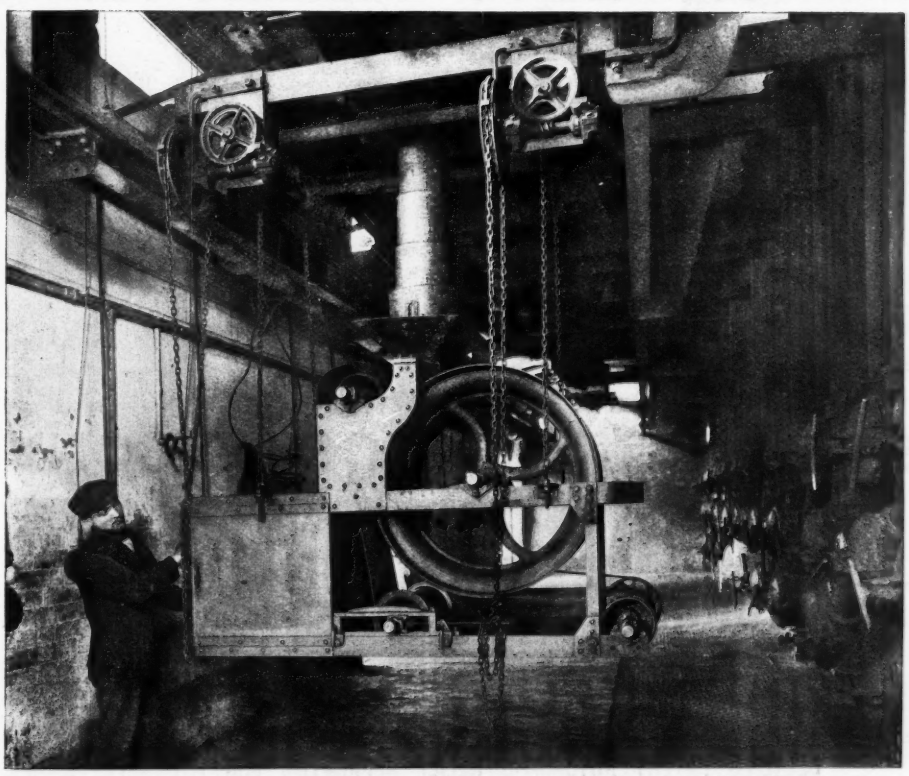
Easily removed and replaced.

Any Design or Shape.

Sole Agents and Manufacturers.

London Office: 106, CANNON STREET, E.C.

THE D.B. PATENT COAL-PROJECTOR.



REPRODUCTION OF A PHOTOGRAPH OF THE D.B. PATENT CHARGING-MACHINE AS AT WORK AT THE DERBY GASLIGHT AND COKE COMPANY'S WORKS (CAVENDISH STREET).—J. Ferguson Bell, Esq., Engineer.

For full Particulars, apply to Sole Manufacturers—

W. J. JENKINS & CO., LTD., RETFORD.

ALBION IRON WORKS,
MILES PLATTING,

MANCHESTER.
TELEGRAMS—
"STOKER, MANCHESTER."

WEST'S GAS IMPROVEMENT CO., LD.,

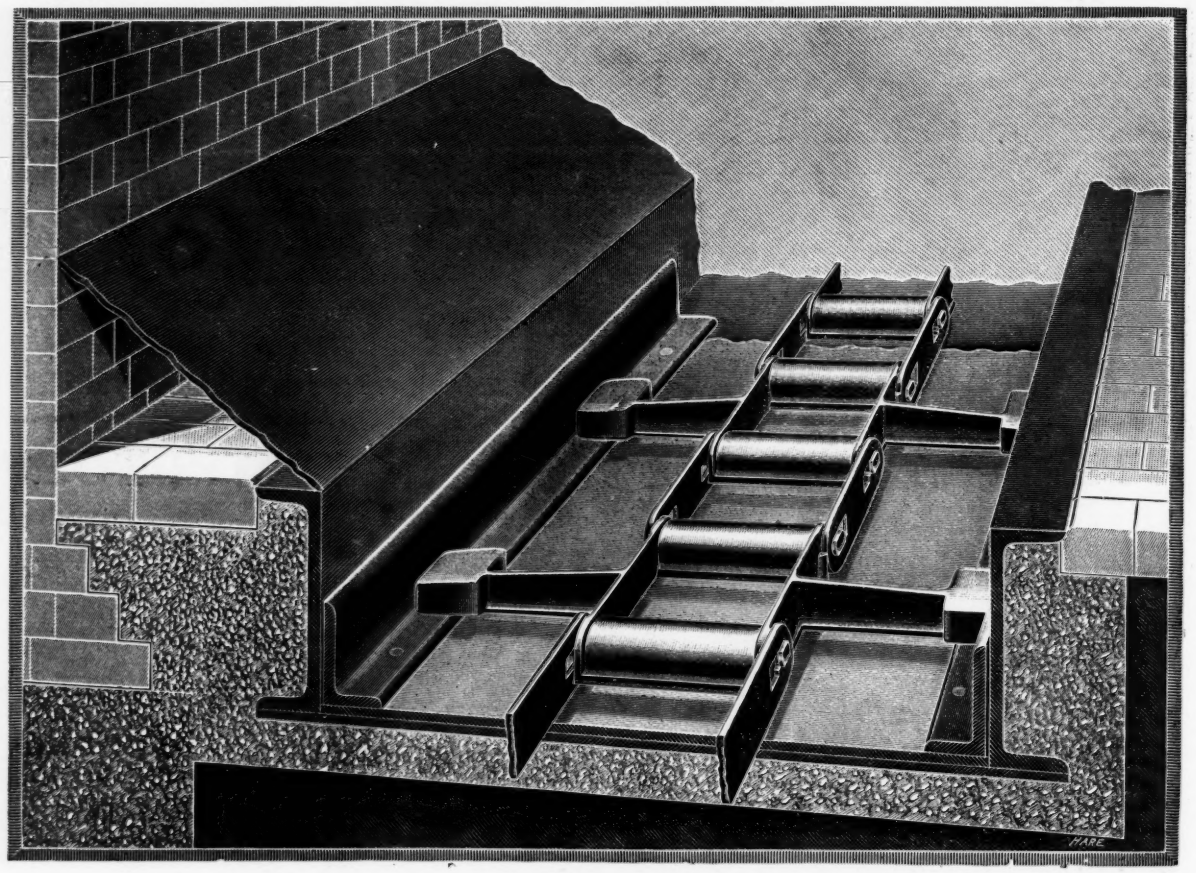
Gas and General Engineers.

CONTRACTORS FOR

COMPLETE RETORT-HOUSE PLANT

. . . EITHER ON . . .

THE HORIZONTAL OR INCLINED SYSTEMS.



SECTION OF

WEST'S IMPROVED PATENT HOT-COKE CONVEYOR,

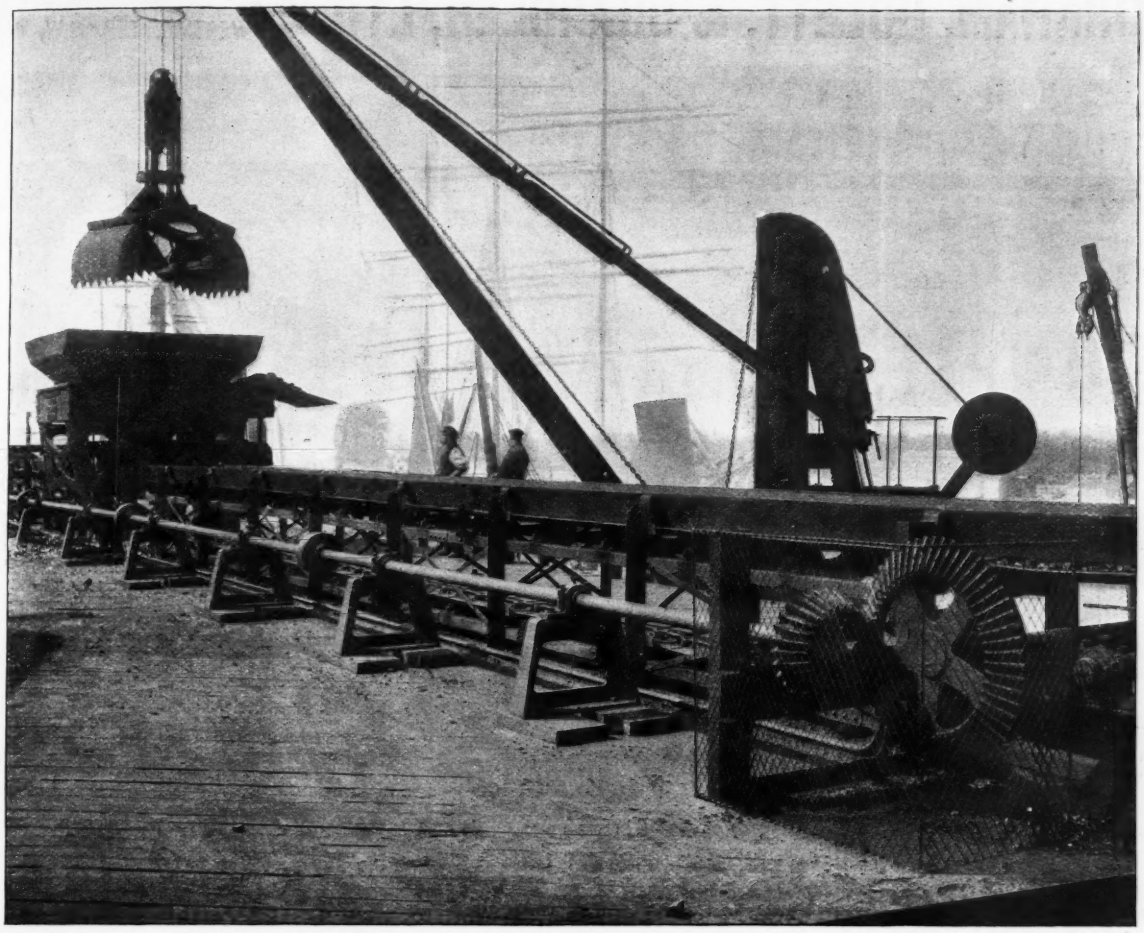
With Special Chain constructed with a minimum number of parts, and having Large Joint Pins with ample Bearing Surfaces.

WEST'S STOKING MACHINERY— COMPRESSED AIR DRIVEN AND MANUAL SYSTEMS

COAL BREAKING, ELEVATING, & STORING PLANTS.

BELTON'S PATENT AUTOMATIC RELIEF APPARATUS FOR HYDRAULIC MAINS.

Manufacturers for America: Riter-Conley Manufacturing Company, Pittsburg.



Telegrams: "*Aptitude, Birmingham.*" NEW CONVEYOR COMPANY, LTD., SMETHWICK. *Telephone:* *No. 50 Smethwick.*

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·20.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

D. HULETT & CO., LTD.

Show-rooms and Offices: 55 & 56, HIGH HOLBORN, LONDON.

Lamp & Meter Works: HARPUR MEWS, THEOBALD'S RD., LONDON.

MANUFACTURERS OF

OUTSIDE GAS-LAMPS

Suitable for Incandescent or Ordinary Burners.

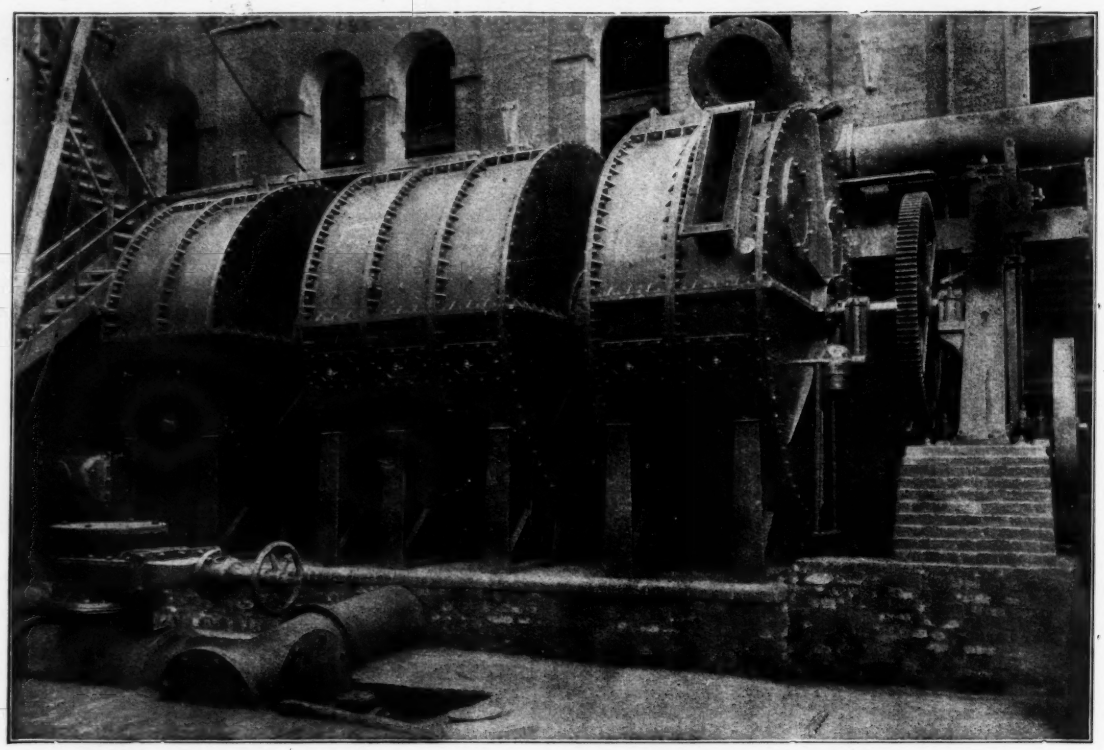
DRY GAS-METERS, SERVICE-CLEANSERS, &c., &c.

PRICE LISTS ON APPLICATION.

KIRKHAM, HULETT, & CHANDLER, LTD.

PALACE CHAMBERS, BRIDGE ST., WESTMINSTER, S.W.

Extracts ALL the Ammonia and large proportion of CO_2 and H_2S.



Maximum Washing Surface. Easy access to Bearings and Interior.

IMPROVED PATENT "STANDARD" WASHER-SCRUBBER.

Telegraphic Address: "WASHER, LONDON."

Telephone No. 127 VICTORIA.

THE GAS-METER COMPANY,

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

STATION METERS IN CYLINDRICAL CASES.

DESIGN No. 2 PATTERN.

STATION METERS MADE AT THE COMPANY'S WORKS, OLDHAM (Late WEST & GREGSON). Established 1830.

For Prices and Particulars apply

F. W. CHURCH, Secretary.

Works: 238, KINGSLAND ROAD, LONDON; UNION STREET, OLDHAM; HANOVER STREET, DUBLIN.

Telegraphic Addresses: "METER LONDON." "METER OLDHAM." "METER DUBLIN." "METER MANCHESTER."

Telephone Nos.: 142 Dalston (Nat.); 340 Oldham (Nat.); 1995 Dublin (Nat.); 2918 Manchester (Nat.)

[See Advertisement on back of Wrapper.

EVERY LITTLE DETAIL

receives attention

IN THE "ACME"

Gas Cooker,

thus making it peculiarly

suitable for Hiring Purposes.

ARDEN HILL & CO.,

BIRMINGHAM.

R. LAIDLAW & SON,

LIMITED

GAS & WATER ENGINEERS,

SIMON SQUARE WORKS, EDINBURGH.

6 LITTLE BUSH LANE, LONDON, E.C.

TWO STATION METERS EACH TO PASS 200000 CUB. FT PER HOUR. ERECTED AT THE

GRANTON GAS WORKS FOR THE EDINBURGH & LEITH GAS COMMISSIONERS.

ALLIANCE FOUNDRY & ENGINEERING WORKS.

GLASGOW.

Messrs. HUMPHREYS & GLASGOW

CARBURETTED WATER-GAS PLANT

— DOUBLE SUPERHEATER SYSTEM. —

	Cubic Feet Daily.		Cubic Feet Daily.		Cubic Feet Daily.
Copenhagen	700,000	Holyoke, Mass	600,000	Maidenhead	225,000
Copenhagen (Second)	2,500,000	St. Joseph, Mo.	750,000	Epsom	225,000
Belfast	1,700,000	Lea Bridge	350,000	North Middlesex	150,000
Belfast (Second)	4,500,000	Lea Bridge (Second)	350,000	Wandsworth & Putney	1,800,000
Brussels—Ville	750,000	Stockton-on-Tees	500,000	Aarhus	800,000
Brussels—Ville (Second)	750,000	Edinburgh	2,000,000	Falmouth	150,000
Liverpool	3,500,000	Guildford	350,000	Southampton	800,000
Liverpool (Second)	4,500,000	Brentford	1,200,000	Hartlepool	750,000
Tottenham	750,000	Syracuse, N.Y.	850,000	Utrecht	1,000,000
Tottenham (Second)	750,000	Bridlington	150,000	Deventer	150,000
Santiago de Cuba.	400,000	Middlesbrough	1,250,000	Portsmouth	1,000,000
Swansea	750,000	Croydon	1,250,000	Bournemouth	1,000,000
Manchester	3,500,000	L. & N.W. Rly., Crewe	700,000	Aylesbury	150,000
Brighton	1,750,000	Taunton	225,000	Hamburg	1,750,000
Preston	1,400,000	Lawrence, Mass.	400,000	Redhill	275,000
New York	1,200,000	Commercial Gas Co.	850,000	Dublin	2,000,000
Southport	750,000	Commercial (Second)	850,000	Posen	450,000
Bath	1,000,000	Commercial (Third)	1,250,000	Dunedin, N.Z.	150,000
Newburgh, N.Y.	350,000	Rotterdam	850,000	Lincoln	500,000
Newburgh (Second)	250,000	Dorking	150,000	Brighton (Second)	1,850,000
Hoylake	125,000	McKeesport, Pa.	500,000	Stockport (Second)	600,000
Coventry	600,000	G. L. & C. Co., Bromley	3,750,000	Croydon (Second)	625,000
Coventry (Second)	600,000	G. L. & C. Co., Nine Elms	2,750,000	Maidenhead (Second)	225,000
Bordentown, N.J.	125,000	Durham	200,000	G. L. & C. Co., Beckton	2,250,000
Winchester	225,000	New York	4,000,000	G. L. & C. Co., Fulham	1,750,000
Shanghai	225,000	Scarborough	800,000	Watford	300,000
Stockport	600,000	Perth, W.A.	125,000	Eastbourne	1,250,000
Norwich	1,000,000	Bremen	550,000		

Since Jan. 1st, 1900.

Antwerp	1,500,000	Waltham	400,000	Sydney—Harbour (Second)	500,000
Brussels—Forest	1,000,000	Geneva	500,000	Sydney—Mortlake (Second)	500,000
Tottenham (Third)	350,000	The Hague	1,000,000	Watford (Second)	350,000
Sydney (Harbour)	500,000	Romford	300,000	Southport (Second)	900,000
Sydney (Mortlake)	500,000	Göteborg	300,000	**FOR THIS YEAR'S CONSTRUCTION.**	
Manchester (Second)	3,500,000	Carlisle	600,000	Dunedin (Second)	275,000
Longton	600,000	Redhill (Second)	300,000	Taunton (Second)	350,000
Hull	1,500,000	Heidelberg	200,000	Bognor	100,000
St. Gallen	225,000	Rotterdam (Second)	1,500,000	Bournemouth (Second)	500,000
Colney Hatch	400,000	North Middlesex (Second)	200,000	Vienna	3,500,000
Dublin (Second)	2,000,000	Rotterdam (Third)	750,000	Maastricht	200,000
Birmingham	1,500,000	Merthyr Tydfil	300,000	Antwerp (Second)	1,000,000
Tunbridge Wells	1,000,000	Shanghai (Second)	225,000	Tottenham (Fifth)	1,000,000
Faversham	200,000	Magdeburg	1,400,000	The Hague (Second)	500,000
Staines	600,000	Posen (Second)	700,000	Hampton Court	500,000
Commercial (Fourth)	2,000,000	Barrow	300,000	Lea Bridge (Third)	400,000
Southampton (Second)	500,000	Reichenberg	200,000	Dublin (Third)	650,000
Liége	1,000,000	West Ham	1,500,000	North Middlesex (Third)	75,000
Hebden Bridge	200,000	Deventer (Second)	200,000	St. Gallen (Second)	225,000
Chorley	300,000	Bremen (Second)	950,000	St. Josse, Brussels	1,000,000
Stafford	500,000	Malta	400,000	Dundee	1,500,000
Bridlington (Second)	200,000	Croydon (Third)	625,000	Bridgwater	200,000
Beckton (Second)	10,750,000	Tilburg	400,000	West Ham (Second)	800,000
Tottenham (Fourth)	1,000,000	Ostend	100,000	Brieg, Silesia	100,000
Gosport	200,000	Zwolle	200,000	Brussels—Ville (Fourth)	350,000
Brussels—Ville (Third)	1,500,000	Utrecht (Second)	1,000,000	Innsbruck, Austria	200,000
Swansea (Second)	1,000,000	Port Elizabeth	400,000	Marlborough	100,000

H. & G. TOTAL OF ABOVE CAPACITIES **150,200,000** CUBIC FEET DAILY.
UNITED GAS IMPROVEMENT CO., U.S.A. **423,200,000** CUBIC FEET DAILY.

TOTAL 573,400,000 CUBIC FEET DAILY.

38, VICTORIA STREET, LONDON, S.W.
Telegrams: "EPISTOLARY LONDON."

UNITED STATES OFFICE:
BANK OF COMMERCE BUILDING, NEW YORK.

CONTENTS.

EDITORIAL NOTES.

GAS, &c.—
The North of England Meeting 285
Income-Tax and Valuation 285
Gas Consumption and the Wealth of Nations 286
The Gas Affairs of Paris 286
A Monstrous Circular from Belfast . . . 287
An Australian Rating Appeal — Casual Labour in Gas-Works—How Ability is Appreciated at Leicester—Reduction of Price or Free Maintenance—In Argentina: Prosperity and an Ungracious Order—Questions and Answers—Rising Rates in Manchester 287

ESSAYS AND REVIEWS.

Further Experience of the Workmen's Compensation Act in Gas-Works 289
A Check on Municipal Extravagance . . . 290
Electric Lighting Memoranda 291
Paints and Painting for Gas-Works . . . 292
Gas or Coal in the Potteries 293
From the Ohio Question-Box—Third Notice . 293
Gas and Water Stock Market 294

COMMUNICATED ARTICLES.

A Study of Some American Gas-Works. By A. J. Walker, of Leith 295
A Plea for One Price. By Norton H. Humphrys, Assoc.M.Inst.C.E., F.C.S. . . . 295

TECHNICAL RECORD.

North of England Gas Managers' Association—Half-Yearly Meeting at Newcastle-on-Tyne—
General Business 297
The Affiliation Question 297
Discussion on Mr. Hovey's Paper on the Tynemouth Gas-Works Extensions . . 297
Lecture by Mr. Jacques Abady on Photometry 301
Progress in Gas Manufacture in England and America 307
One of the Beckton Gas-Works Piers . . . 296

TECHNICAL RECORD (*continued*)—
Protecting Pipes against Electrolysis . . . 309
Welsbach and Kern Cookers and Appliances 310
London and Southern District Junior Gas Association 311
Ohio Gaslight Association—Annual Meeting at Cleveland 313
A Comparison of Gas Outputs 313

REGISTER OF PATENTS.

Producing a Mixture of Gases, or of Gas and Air, for Illuminating Purposes—Lake, H. H. (Selas Gesellschaft, m.b.H.) 315
Pipe Joint—Gilbert, J. P. 316
Purification of Gas—Jas, F. 316
Charging Internal Combustion Engines—Lindeman, O. (Körting Bros.) 316
Inverted Incandescent Gas-Burners—Haddan, H. J. (Actien-gesellschaft, Stobwasser) . . 316
Gas-Fire Stoves—Fletcher, Russell, and Co., Ltd., and Neil, J. & W. R. 316

CORRESPONDENCE.

The Award in the Nantwich Arbitration . . 317
Stops—Not Slots 317
The Earl's Court Exhibition 317
Estimation of Naphthalene in Coal Gas . . 317

PARLIAMENTARY INTELLIGENCE.

Progress of Bills 318
Gleanings from the Committee Rooms . . 318

LEGAL INTELLIGENCE.

High Court of Justice—King's Bench Division—Weardale and Consett Water Company *v.* Chester-le-Street Coperative Society; Water for Fire Extinction. 319
The Assessment of the Exeter Gas-Works—Further Hearing of the Gas Company's Appeal 319
Smart Sentence for a Prepayment Meter Theft 320

MISCELLANEOUS NEWS.

The Chard Arbitration Award 320
The Nantwich Arbitration Appeal 320
A Rating Appeal at the Antipodes 321
Dukinfield Corporation Gas Department . . 321
Royal Commission on Coal Supplies—Evidence Bearing upon the Gas Industry . . 321
River Plate Gas Company, Limited . . . 323
Paris Gas Company—Report and Accounts for the Year 1903 324
Colonial Gas Undertakings 325
Gas, Electricity, and Water at Rochdale . . 325
Blackpool Corporation Gas Supply . . . 325
Incandescent Gas Lighting in Edinburgh—Amended Scheme Adopted 326
The Marylebone Electric Lighting Question. 327
Gas and Electricity Supply in Rome . . . 328
Interfering Councillors and Corporation Officials 328
Metropolitan Water Board 329
Notes from Scotland 330
Current Sales of Gas Products 331
Coal Trade Reports 332
Stock and Share List 333

PARAGRAPHS.

Institution of Civil Engineers—An Ill-Founded Hope 292
Junior Gas Association for Scotland, Glasgow and West of Scotland Branch—Masonic . 294
Personal. 295
Annual Meetings of the French and Italian Gas Societies 309
Curious Cause of Decreased Gas Consumption
Gas-Meter Testing in Manchester—Gas-Ovens in London Restaurants—Edinburgh and Leith Coal and Meter Contracts . . 317
A De Brouwer Projector for Neath. . . . 319
Progress of the Birmingham Welsh Water Scheme—Gas Profits at Blackburn—Sales of Stocks and Shares—Derwent Valley Water Board. 320
Electric Lighting Scheme at Carnarvon . . 325

HENRY BALFOUR & CO.

LIMITED,

LEVEN, FIFESHIRE.

Contractors for the Supply and Erection of all Classes of

Gas-Works Plant.

THE "ANNULAR" BRUSH WASHER-SCRUBBER

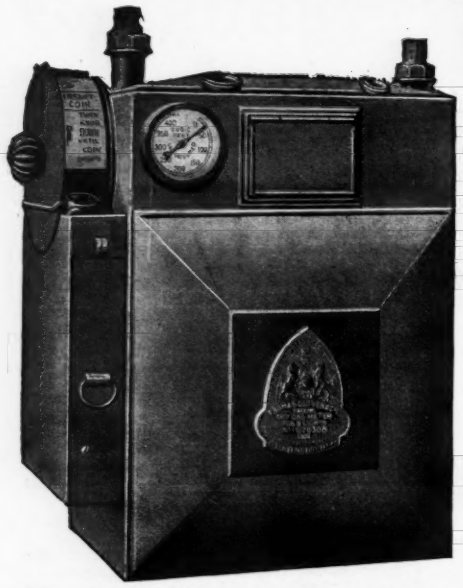
(CREEKE'S PATENT).

Made with Cast-Iron or Mild Steel Cylinders.

PRICES AND PARTICULARS ON APPLICATION.

London Representative: MR. HENRY PUPLETT, 47, VICTORIA STREET, S.W.

THOMAS GLOVER & CO.'S



PATENT NEW IMPROVED PREPAYMENT METER

For Pennies, Shillings, or any Coin.

Simple in Mechanism.
Positive in Results.
Price Changer *in Situ.*

GUARANTEED FOR FIVE YEARS.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

THOMAS GLOVER & CO., LTD.,

GAS-METER MANUFACTURERS,

LATE OF CLERKENWELL, NOW 49, QUEEN VICTORIA STREET.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 6159 Bank.

BRISTOL:	BIRMINGHAM:	MANCHESTER:	GLASGOW:	BELFAST:	MELBOURNE:
28, BATH STREET. *Telegraphic Address:* "GOTHIC." Telephone No. 1005.	57 & 58, BROAD STREET. *Telegraphic Address:* "GOTHIC"	132 & 134, CORN EXCHANGE BUILDINGS. *Telegraphic Address:* "GOTHIC." Telephone No. 3898.	26, WEST NILE STREET. *Telegraphic Address:* "GASMAIN." Telephone No. 6107 Royal.	8, EXCHANGE PLACE, DONEGALL STREET. *Telegraphic Address:* "GOTHIC."	23, WRIGHT'S LANE, LONSDALE STREET. Telephone No. 3716.

PARKINSON'S

PREPAYMENT METERS

For Pence, Shillings, or any Coin.

SIMPLICITY .
DURABILITY . .
EFFECTIVENESS } COMBINED.

PARKINSON AND W. & B. COWAN, LTD.
(Parkinson Branch),

COTTAGE LANE, CITY ROAD, LONDON.

BELL BARN ROAD, BIRMINGHAM.

JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

VOL. LXXXVI., No. 2138.—TUESDAY, MAY 3, 1904.

EDITORIAL NOTES—GAS, &c.

The North of England Meeting.

AT the meeting of the North of England Gas Managers' Association at Newcastle on Saturday—under the presidency of Mr. Frank P. Tarratt, of Darlington—there was an end first and a beginning afterwards. The ending that was effected was the consideration of the most instructive paper which was contributed at the meeting held in Darlington in October, by Mr. A. Clement Hovey, of Tynemouth, upon the recently completed extensions at the Tynemouth Gas-Works. On Saturday, Mr. Hovey read a supplementary paper, giving the results to date of the working of the new plant—a communication which was put together with the same care as his first elaborate paper, and which would, of itself, have formed a sufficient subject for consideration at the meeting. The original paper was of such a nature that it did not lend itself to criticism; being full of constructional details. In the supplementary paper, however, there were conclusions reached which were more open to remark; and on them the members of the Association had something to say, though not much of any great consequence.

It will be conceded that the experiences of gas engineers in the matter of stopped ascension-pipes can scarcely be magnified into a subject of the first importance. In the reduction of naphthalene in gas there was a subject of which much could have been made, and there was some intelligent criticism of it. Probably the interest which most attaches to all that was brought forward is in the testimony which was borne in the paper to the value of Mr. Carpenter's process of condensing. There is here room for the doing of work, and of work which should not be very difficult to accomplish, because no great cost is involved, and if the results obtained at Tynemouth were approached, a great benefit would have been easily gained. Mr. Hovey's figures on the cost of carbonization were also commented upon, in the direction of favouring the introduction of machinery for coal and coke handling. It should not be overlooked that the favourable results from the working of machinery at Tynemouth have been found in a comparatively small make, which should provide food for reflection to those who maintain that machine working in the retort-house can only be made to pay in large-sized works. This will suffice for the part of the meeting for which Mr. Hovey was responsible. His work now goes out in a completed state, and will form a sort of miniature handbook for gas engineers who may be contemplating extensions of their works.

The other salient feature of the meeting was the lecture by Mr. Jacques Abady upon "Photometry." This, it is to be hoped, will be found to be the beginning of a time of keener interest in the subject of the application of gas to lighting. It is some years since the leading purveyors of gas awoke to the topsy-turveydom of the laws relating to the measurement of light, if not to the injustice of many of the legal requirements. The great body have not yet, it is to be feared, got beyond the stage of academic interest in the matter. But they cannot now help being drawn into being more actively concerned with the subject; if for no other reason, because gas lighting is tied down by enactments on the fringe of the penal code, while those who purvey other lights are under no other disabilities, if they fail to give satisfaction, than those which may be dealt with by civil process, or be regulated by commercial custom. Gas consumers are much more "protected" than others, and consequently have to pay more for the product than have the users of other modes of lighting. This would be bad enough if it were all; but the many weaknesses in the law, as administered, lead to aggravations which might be avoided if the practice of the measurement of light were, what may be termed, brought up to date. In order to do this, it is necessary that those who supply by far the greater amount of light should not be placed in the worst position of all. To accomplish this they must first know what they want. That is what is being found out, in individual cases, when parliamentary powers are sought; and it is in this connection that the subject is chiefly coming to attract more attention. Mr. Abady's lecture was so pointed that it cannot fail to produce mind-searchings upon the matter in quarters where the policy of do-nothing has hitherto ruled. It is difficult to conceive anything finer than his scathing exposure of the vagaries of lighting effect, as illustrated by his diagram and table of the light derived from the same gases when tested under different conditions. He might well speak of the absurd, old-fashioned system which is keeping back progress. It is matter of much satisfaction that so learned a pronouncement upon this important question should have been made at this moment; and the North of England Association are to be congratulated upon being the medium through which the subject has been so opportunely brought forward.

It remains to be noted that the Association resolved unanimously to join with the Institution of Gas Engineers in their scheme of affiliation—the Association to retain their independence in every way, without which condition, it is to be presumed, they would have held back. Note may also be made of the gratifying fact that the scheme for the provision of technical education in gas manufacture, which the Association inaugurated six months ago, has already become a success; and due acknowledgment was made of the services of Mr. Herbert Lees, of Hexham, who last winter conducted the class at the Rutherford College, Newcastle.

Income-Tax and Valuation.

ON Thursday last the Chancellor of the Exchequer took an opportunity of announcing in the House of Commons the names of the Income-Tax Committee, and the terms of the reference. The Chairman of the Committee will be Mr. Ritchie, the ex-Chancellor; and most of his colleagues are Inland Revenue officials, or are otherwise known for their interest in the subject of income-tax practice. Among the terms of the reference occurs mention of "the allowances "made in respect of the depreciation of assets charged to "capital account." It may be recollected that Mr. Crowther Smith, when Secretary of the Southampton Gas Company, took a leading part in moving for reform of the methods of the Income-Tax Commissioners in relation to the gas industry; and it is to be hoped that the cause of the industry in this regard will not lack competent defenders, if the present Committee desire to go into the matter.

Another important feature of recent parliamentary proceedings was the introduction of the Government Bill to amend the law with respect to valuation authorities. This measure has been printed; but it is not prefaced with the now customary official memorandum explanatory of its intention. Consequently, one must take the clauses as they stand, without having any guidance as to whether they are novel, or as to the extent of the alteration of the existing law, if any, which is proposed. From the introductory remarks of Mr. Long, however, it is to be gathered that the existing multiplicity of assessment authorities outside the Metropolis, which has its own law, is to be superseded by a consolidation of this duty, and its imposition on the County and County Borough Councils. The Bill generally adopts, with some slight modification, the recommendations of the Royal Commission. This practically amounts to the application to the rest of the country of the system existing in London, with certain alterations. We shall have to go more fully into the proposals of the Bill on another occasion; but for the present it will be sufficient to emphasize the leading features of the measure, which are the creation of a single authority for valuation and assessment purposes, instead of the numerous authorities now exercising this power, and the introduction of uniformity in the practice. One of the most debateable parts of the Bill is that relating to a scheme of districting. In the first place, the Council of every county and county borough will be the valuation authority for their county or borough. In the case of a county, it may either be undivided or be districted (for the purposes of the Act)

according to population—50,000 being the unit. If any non-county borough or urban district within the county has a population of this number, or more, it may be a separate valuation district. The valuation authority will act by a Special Committee, not necessarily exclusively formed of their own members. Special provision is made for the appointment on the Committees of representatives of Boards of Guardians. New lists are to be made out during the first year, and are to be revised every five years. These lists are to be conclusive for all purposes. Appeals will be, as now, to Quarter Sessions. It was stated by Mr. Long that the Government propose to deal with railways and canals in a separate measure. "Specials," however, are mentioned in the Bill. It is provided that this class of hereditaments may be valued by a person to be selected for the purpose, instead of by the Overseers. Valuation assessors, to assist the Committee, may also be appointed for any period, and be paid by salary or otherwise. So far as can be ascertained from a cursory inspection, the drafting of the Bill is extremely clear; and there is a commendable absence of legislation by reference. The enumeration of enactments repealed as regards England and Wales (the Bill does not extend to Scotland or Ireland) fills a long schedule.

Gas Consumption and the "Wealth of Nations."

In another column will be found an abstract of a paper by Mr. J. T. Westcott, prepared for the Ohio Gaslight Association at the request of the President, who reasonably thought his American colleagues would like to learn why the consumption of gas per head of the town population in the United Kingdom is so large as compared with the corresponding figure for other countries, and not unreasonably imagined that a cosmopolitan gas engineer might be able to answer the question correctly. It is with considerable regret that, having carefully read Mr. Westcott's reply to this interesting and suggestive inquiry, we are forced, by the supreme demand that such information should be really helpful, to take exception to some of his deductions from the statistical data he has put forward for his purpose, if not to the facts themselves. Generalizations are valuable aids to comprehension, or the reverse, just as their content is in the main right or wrong. In the present case, Mr. Westcott has chosen to copy the oratorical trick of the "popular" preacher, and starts his lucubration with a good thumping general statement that "the *per capita* wealth of most coun-"tries is proportionate to the amount of gas consumed." The object of this manœuvre is to astonish; and Mr. Westcott's model—the artful pulpiteer—having woke up his congregation, thereupon proceeds to hold their attention, if he can, while he works up to his triumphant proof of the "startler" with which he commenced. Mr. Westcott, unfortunately, fails to justify his opening generalization. Indeed, he does not make any attempt to do so, but immediately wanders away from his point in vague talk about English fogs, and other topics, which may have some relation to gas consumption, but certainly have nothing to do with the wealth of nations. This is what we are anxious to hear about. If Mr. Westcott has any reason for his assertion that the wealth of most countries is proportionate to the gas consumption per head of the population—which statement, of course, is susceptible of being turned about, to signify that gas consumption per head of population is proportionate to national wealth—he has omitted to give it. Yet it can be easily surmised that this was precisely the matter that the Ohio Gas Managers were dying to have expounded to them. Only once, and that by implication, did Mr. Westcott return to his text. This was in his last paragraph, where he remarks that "English "large outputs are traceable to conditions unknown to "America." If the meaning intended to be drawn from this cryptic utterance is that America, as a nation, is not half so wealthy as England, and therefore cannot be expected to burn more than half the quantity of gas per head of population, why not have said so, and be done with it?

Leaving, however, this somewhat invidious reflection upon the relative wealth of the nations of the earth—a delicate and difficult subject of inquiry, at any rate, and hardly one to be disposed of by the reading of consumers' gas-meters—let us point out, as we are free to do without going into the international question at all, that Mr. Westcott's selected statistics of British gas supply districts absolutely contradict his conclusion. This will appear glaringly, and on the face of his own figures, which should make out the Brentford division of the County of Middlesex to be far and away the wealthiest part of the British Isles! Those who know the locality will be best able to judge of the reasonableness of this inference; but, for the behoof of strangers, it must suffice to remark that this is a very scattered suburban region, in which the slot-meter predominates. It is very far from being a rich neighbourhood; and Mr. Westcott's *per capita* figure relating to it is either wrong or is misleading. His figure for the yearly consumption of gas per consumer is by no means in keeping with it. The truth is, that it is easier to go wrong than keep right in taking the population of any gas-supply district, more particularly a suburban one, which includes the whole, and parts, of many local government areas. But enough of this. Sufficient has been said to prove that, whatever may be the ground of Mr. Westcott's startling generalization in regard to the wealth of nations, it is not to be found in the few British gas statistics given in his paper. It would be easy to pick other holes in these tables—notably as to the omission of Plymouth, and the quoting of some gas prices on a different basis from others.

It is a pity that the practical-minded gas managers of Ohio were offered this paper in place of the solid information, dealing with business points, they had a right to expect. One of their number, Mr. Knight, hit the nail on the head when he observed, in criticism of Mr. Westcott's opening generalization, that in the cities he is familiar with "the *per* "*capita* amount of gas consumed depends largely on the "work done to get the business." This is solid wisdom of the mercantile order, such as one has been in the habit of expecting from the typical American business man. We should like to shake hands across the sea with Mr. Knight, and wish the universal gas industry had more of his sort. Truly, there is no general reason, exclusive and sufficient, for the large output of gas per head of the population in the United Kingdom; but there are many causes which contribute to it. As the Pompadour said of national morality, it is "largely a question of latitude." Next, the ruling cheapness of gas in this country has contributed to the extent of the sales; and the statutory system of supply, which favours incidental reductions of price as with every other commodity, must be credited with a good deal of the merit. Besides, the undertakings are products of the soil, and have grown up with the towns they serve. Some English gas companies will soon be thinking of celebrating their centenary. There are other reasons for the cheap English gas; but these are enough for the present. In order not to conclude our protest against Mr. Westcott's recent performance without agreeing with him in some respects, we gladly admit the correctness, in these regards, of his closing statement that most of these conditions are "unknown to America," as to the Continent of Europe. After all, the gas industry is of British origin; and it should not be so very wonderful that it has flourished best in its native land. Still, the fruit it has borne in other lands is not to be despised; and especially would one wish to believe that everywhere it is not so much the wealthy as those who have most need of the benefits of gas, who make the fullest use of this necessary of town life.

The Gas Affairs of Paris.

The affairs of the Paris Gas Company always possess a high degree of interest; and especially is this true at the present time, when the tenure of the existing organization for the supply of gas within the French capital is fast running out. The abstract translation of the report of the Directors and the principal items of the accounts of the Company for the past year which appear elsewhere will not have many successors in the same form. They show a considerable increase in the consumption, which has thus responded in the normal way to the reduction in the price of gas which took effect at the beginning of last year. There was an even more gratifying increase in the number of consumers, from 491,193 to 596,986. This proves in the strongest manner that the capacity of the population of Paris to absorb gas is far from being satisfied. Owing to the peculiar character of the living conditions of this population, who are all flat-dwellers, great difficulty was for a long time experienced in obtaining them as gas consumers; but some years ago the Company met them half-way by running so-called "rising "mains" to the floors of tenement houses. More recently, the fitting-up of the tenements themselves has been added to this provision. As usual, the Company have prospered

financially, and the manner of disposal of their substantial profits is duly explained in our report. The greatest amount of curiosity, however, will be manifested with regard to the course which the Company are advised to take in view of the approaching lapse of their concession. A final offer of terms by the Company for the City supply for an extended period of twenty years was rejected; and the Municipality decided to take over control of the service. This decision was arrived at last July; and the Bill to give effect to it is still on its way. Various constitutional obstacles have arisen to cause this delay. Meanwhile, a new Company has been formed, largely by the shareholders of the Paris Company, to carry on the supply to the outlying communes. The new Suburban Company is practically a child of the Compagnie Parisienne, and this probably suits all parties equally well. What will happen if the bonds of "red tape," which are even stronger in France than in England, are found to hamper the formation of a new Gas Company for Paris itself, no one can foresee. Time is running on; and still the Chamber of Deputies are deliberating, and the Prefect of the Seine is being consulted as to how this great business is to be municipally managed. It is no wonder that the French Government are hesitating over the pronouncement of the fatal decree that will destroy the excellent and in every respect admirable administration of the great Company, and substitute for it the rule of amateurs who have no experience of important business. If gas would only get itself made automatically, the Parisian bureaucracy would doubtless be equal to the duty of watching over it, and seeing that it came to no harm that the police could prevent. But French Governments have never taken kindly to trade; and it seems a hazardous experiment to begin with such a vast concern as the gas supply of Paris. The references to the future in the Directors' report are studiously reserved —"*parce qu'on ne peut pas savoir ce que peut arriver.*" The Company are not gone yet.

A Monstrous Circular from Belfast.

Officialdom in discussing the question of municipal *versus* private management of trading enterprises will, the progress of time makes it more and more clear, have to consider as an important factor the respective positions of those upon whom the real responsibility of the management rests under the two forms of administration. From several quarters, we learn that the life of the officials of many municipal bodies with the advance of things (as advance is interpreted and measured in some municipal circles) is getting well-nigh intolerable. They are subjected to all kinds of pettifogging actions, attacks, and commands of a certain type of municipal councillor who gets on a committee, but has not a pennyworth of interest in the undertaking (this applies to the productive as well as the unproductive concerns of a local authority), and whose main object in public life is manifestly to get out of it all the notoriety possible, or to cause as much discomfit as a sharp tongue, a blunted consideration for the feelings of other people, and a paltry-spirited following will allow him. The doings of some of the councillors on many local governing bodies put to shame the nurtured notions and boasts of fairplay being one of the uppermost traits of the British character. The class of councillor that we have in mind calls in question all sorts of petty acts, asks for reports and investigations upon and into all kinds of minor matters, and keeps at the bidding of his insatiable will and requirements (which very rarely serve any purpose other than that of affording food for his mobile tongue in and out of the Council chamber) the officials constantly on an ineffective treadmill, and in a state of feverish anxiety as to what may happen next. The methods of such men (who seem to do much as they like) are nothing short of a form of persecution, they have no good end, and are detrimental to the best interests of the concern whose officials are thus harassed. Herein there is something that is fast becoming one of the scandals of our modern municipal life.

To the want-to-know and cavilling spirit which animates such councillors as these, and is an important feature of their tactics, is largely due the continuance of the impertinent annoyance caused by the circular of inquiry. One rarely hears nowadays of such circulars emanating from gas companies. When a fresh example is brought to notice, it is invariably found that it has emanated from some municipal body, which is a fact supporting the evidence on which we have been constrained to pen the foregoing protest. The officials who have to draft, append their names, and send out these intrusive missives—claiming the time and consideration of the officials serving and paid by other people—are more often than not merely the instruments of the class of busybody or cantankerous councillor referred to above. These officials, it is needless to remark, frequently do this work unwillingly, and are disgusted that their honourable positions should be dragged into the dust by the compulsory performance of such undignified work. We cannot imagine that the person who had to send out the last circular forwarded to us by a recipient did so with any feelings other than of repugnance. It was sent from one of the last places from which anyone in the gas industry would have expected such a document to issue. That was Belfast. But, from the information supplied to us by our correspondent—though the document refers to gas finances and accountancy—it is clear that it was not addressed to him by any official of the Belfast Gas Department. It appears to be more likely that it had its forced origin in the City Accountant's Department. However this may be, the circular justifies, in a double sense, the character of monstrous given to it in the heading to this notice. It is unreasonable in every respect. It contains no less than 22 questions, three of which are divided up into from three to half-a-dozen. Their subject-matter ranges over particulars as to the city or borough, the income of the gas undertaking from various sources, discounts, net income from the different sources, number of consumers, the number and positions of the members of the town staff, establishment charges incidental to collection, and the methods of collection and of book-keeping. Whoever gave instructions for this circular to be sent out possesses a full measure of human audacity.

There can only be two objects in this preposterous circular—either improvement or persecution. If it is improvement, then the Corporation are not called upon to go outside their own official circle for advice; and with such old and highly-respected officials, of such proved administrative acumen, as they have in the Gas Department, there cannot be a great deal to improve. It is not too much to say that, notoriously safe in practice and judgment as Mr. James Stelfox and the heads of the other departments of the Belfast gas undertaking are, there is hardly a gas man in the kingdom who would not feel satisfied in going no farther afield than Belfast for counsel in any difficulty. We hope that the whole of those who have received this circular will have treated it in the ignominious manner it deserves; and that, if in his generosity any reader has replied to it already, he will at once send to the Belfast Corporation a protest against its issue. Any such may take it from us that this course will not be the wrong one.

An Australian Rating Appeal.

An illustration has been received which shows that strange fancies in respect of the valuation of gas-works property are not peculiar to this country. For a considerable number of years past, the Gas Company of Bendigo—a city some 100 miles from Melbourne—has been paying on a valuation of £1200; but suddenly the local Council's valuer clapped on a further £1764—making the valuation £2964. This valuer did his intelligence a terrible injustice when he excused his old "valuation" by saying that, at the time he fixed it, he "understood" an agreement was in existence between the Council and the Company; but he now finds that there is no such agreement. Surely this sweet simplicity on the part of the valuer is not what the Council have been paying him for. However, when his understanding had been set right, he did himself another injustice, by making it clear that he did not precisely understand the methods that are customary in determining the value of a property such as a gas company's. He made his calculations by the aid of that mythical creation the hypothetical tenant; and, having so far arrived at his figures, he altogether neglected consideration of any statutory deductions. But in justice to him, let it be said that he stuck by his figures; and the Local Authority stuck by him, with the natural result that the latter are now to have the pleasure of paying the costs of an appeal by the Gas Company, and the deductions are to be allowed, which will make the new valuation £1642. If the valuer had recognized the deductions in the first place, it is possible there would have been no appeal, as his assessment (without taking into account the deductions in either case) was

within a few pounds of those of the Gas Engineers called by the Gas Company—Mr. S. E. Figgis, the Engineer of the Ballarat Gas Company, and Mr. C. Percy Holmes Hunt. The decision here referred to creates a precedent in Victoria, as, by the acceptance by the Court of the £1642, 21 per cent. is allowed on tenant's capital —*i.e.*, 6 per cent. interest, 10 per cent. profits, and 5 per cent. for risks, &c. It will be observed with interest from the report in another column that electrolysis was named in this case as an additional risk; Bendigo having a system of electrical trams, which was started about a year ago. A few words of a personal character. We must congratulate Mr. Percy Hunt on his success in so soon proving himself on his arrival in Australia. To have won the confidence of the Board and chief officials of the Metropolitan Gas Company of Melbourne to an extent that warranted them in entrusting to him their large works for a complete year during the absence of the Chief Engineer, and now, in addition, acting as an expert in a rating appeal, is an excellent start in upholding on the other side of the globe a name that is very highly honoured on this.

Casual Labour in Gas-Works.

In connection with the paragraph on this subject which appeared in last week's issue of the "JOURNAL," our attention has been called to a plan which for a great many years past Mr. F. L. Ramsden has found to work quite satisfactorily at Burton-upon-Trent. As this arrangement has never given rise to the slightest trouble with the men, a brief outline of it may perhaps be of assistance to managers who have not already adopted some plan which time has proved to be efficacious in avoiding all possibility of dispute. Mr. Ramsden has no agreement with his stokers; but there is a rule that they are not to be taken out of the retort-houses or discharged (except through misconduct) without a fortnight's notice. As soon as Christmas is turned, notices are given out in batches of a dozen at a time; and when the fortnight has expired, if the men are kept on they have to sign a form which is addressed to them by Mr. Ramsden, and is to the following effect: "The notice I gave you on . . . last having now expired, if you are agreeable I shall be able to find you work for a short time longer; but it must be on the distinct understanding that I am at liberty to dispense with your services at any time without further notice, and you are, of course, at liberty to leave me at any time to suit your convenience without giving me any notice. If you are disposed to remain on these terms, please sign and return me this paper." This is a very simple method, and one that does not appear to leave any loophole whatever for an appeal to a County Court Judge. No man who signs the form can be in the slightest doubt as to his position on the works.

How Ability is Appreciated at Leicester.

It will be seen by a paragraph which appears under the head of "Personal" in another part of the "JOURNAL," that the value of the services rendered by Mr. Alfred Colson, in the capacity of Engineer and Manager of the Gas and Electricity Departments of the Leicester Corporation, has been recognized by an addition of £250 a year to his salary, bringing it up to £1500 per annum. It is some thirteen years since Mr. Colson had an advance, and in the interval he has superintended the introduction, and been responsible for the working, of the electric light undertaking of the Corporation. Mr. Colson's ability as a Gas Engineer does not require emphasizing here. But he combines with this the special knowledge of a chemical manufacturer; and he has now added to it electrical engineering. Are these abilities worth the extra £250 a year for which he applied to his Committee? This was the question they had to consider; and their answer was a recommendation to the Council that it should be granted—the addition to be charged to the Electric Lighting Department. We congratulate the applicant that they fully acquiesced in the recommendation. We should do so, however, with very much more pleasure if the result had been arrived at by a more numerous majority. As a matter of fact, the well-earned increase was only accorded by the casting vote of the Mayor. All through the discussion, the Socialist element in the Council made itself conspicuous; and all the well-worn arguments were brought forward against a recommendation which required no elaborate speeches to defend it. If a monument is required to Mr. Colson's ability, let the Corporation—or rather, we should say, the Socialist members of it—look to their accounts. The man who can manage commercial undertakings so that they yield profits of £20,000 and £30,000 a year, after paying interest and sinking fund, is one of no ordinary calibre; and we advise the Leicester Corporation to make it worth his while to serve them. Something was said on Tuesday about dividing the duties of Mr. Colson's office, and, of course, the salary—in other words, having three or four men to do the work now performed by one. People who clamour for divided authority cannot have had much experience in carrying on big undertakings. The fabulists of old possessed much more wisdom. They showed how difficult it was for the dragon with several heads to pass through a hole in a hedge; but how extremely simple it was for the animal possessing but one, and a number of tails, to accomplish this feat. The moral of this story, in the language of the immortal Captain Cuttle, lies in the application of it.

Reduction of Price or Free Maintenance.

The proposition that, instead of driving down to the uttermost penny the price of gas, gas suppliers should keep in hand something with which to maintain in order the consumers' means of using the gas so as ensure and sustain contentment, and as near as may be a perfection of the benefit to be derived from the gas, is one upon which intelligence has not given any assurance of a widespread adoption. The Hampton Court Gas Company and their Engineer and Manager (Mr. W. E. Price) have, however, recognized its importance. Mr. Price finds that the fixed charge system for maintenance is resented by some, who object to pay for burners which are seldom or never used; and beyond this the system is—of course, it must be so—merely partially effective, inasmuch as it only applies to those who can afford or who care to pay for the service. This being so, the Company have adopted the plan of making no charge for the fixing and subsequent attendance to incandescent or other burners, asking only ordinary shop prices for the material used—in other words, their new policy is to keep any type of burner in order with as little trouble and expense to the consumers as possible. The circular distributed among the consumers announcing the good tidings states that the Company "are prepared to send competent men periodically to clean incandescent burners free of charge, and to replace mantles, chimneys, rods, &c., at the lowest possible prices." Upon receiving a communication from a consumer that he desires to avail himself of the Company's free services in this direction, the maintenance man inspects the burners every month, or at shorter intervals if specially requested. Mr. Price does not expect the plan to cover expenses, but he considers that "the cost of the service will be *more appreciated by consumers than an equivalent reduction in the price of gas*." Readers will await with interest some further communication from Mr. Price as to his experiences resulting from the issue of the circular. Meantime, if any other gas managers have tried this or a similar plan, we shall be pleased to hear how they have fared. It is probable, however, that Mr. Price has in this matter gone a step beyond his compeers.

In Argentina—Prosperity and an Ungracious Order.

There was so much to be said at the recent meeting of the Primitiva Gas and Electricity Company about the sale of the electrical department, that little light was thrown by the Chairman (Mr. H. E. Jones) upon the inner working of the gas undertaking. That it was good was made patent to all by the splendid advance in the financial position of the concern. The speech of the Chairman (Mr. A. E. Bowen) at the meeting of the River Plate Company, however, fills up the blanks in the information at the Primitiva meeting, regarding the general position of the gas industry in far-away Buenos Ayres. The opening sentences of the Chairman's speech have only to be read to see how sensitive the gas business there is to rises and falls in commercial fortune. Prosperity of a very gratifying character has now come upon the country; and the Gas Companies, in common with other enterprises and the people generally, appear to be revelling in it. The River Plate Company have added in the past year 1578 to their house services, having lost to electricity only nine customers. Incandescent lighting, and gas cookers and heaters have also taken on wonderfully; and therefore it will not be astonishing to

find that the consumption of gas which drooped rather during recent bad times is rising again at a pleasing rate. But there is a reverse side to this cheerful face; and here we have one of the weaknesses of businesses of the character of gas supply carried on in some of the remote parts of the globe. Again and again it is found that the local governing bodies take quite a romantic view of their privileges and powers in relation to such companies. In this case, Mr. Bowen states that the Lord Mayor has had an inspection made of the Gas Companies' books, and has ordered a reduction in the price of gas to the private consumers from 24 cents per cubic metre to the non-paying figure of 17 cents. But fortunately the Municipality have not the power to do this wrong; the Companies being protected by binding contracts, which they have no fear of upholding, if necessary, in the Supreme Court.

Questions and Answers.

A considerable amount of success has attended the new departure of the London and Southern District Junior Gas Association, whose meeting last week was devoted to the discussion of questions notified in advance. No fewer than twenty queries had been sent in to the Hon. Secretary (Mr. P. F. Scarth); and when written out they presented quite a formidable list. Indeed, they proved many more than could be adequately considered within the time at disposal; and consequently only the first half were dealt with, the remainder being left over for the May meeting. That such an interesting discussion should have resulted, is highly creditable to the Association, especially in view of the facts that there were not a great number of members present, and that the President (Mr. Walter Grafton) was unavoidably among the absentees—though his place was ably filled by the Vice-President (Mr. R. H. Brown). Evidently the Association are by no means deficient in debating power; and no doubt the speakers at last Friday's meeting would be equally successful if they would try their hands at writing papers. Several of them have already done so; but there are others we should like to see turn their attention in this direction. Generally speaking, the queries submitted were of an extremely practical character, and of interest to everyone engaged on, or in connection with, gas-works; and the discussion therefore cannot fail to have been of benefit to the members.

Rising Rates in Manchester.

In spite of the excellent results achieved by their gas undertaking, the ratepayers of Manchester do not appear to be in at all a happy frame of mind; and the reason for this is not far to seek. On the contrary, it is only too apparent; for the Finance Committee have been considering the estimates of expenditure of the various Committees for the ensuing twelve months, and the result is a prospective increase of more than 8d. in the pound on the average city rate, which will make it about 7s. 1½d. It is only fair to add that more than half of the increase is due to greater expenditure by the Education Committee; but then, on the other hand, it must be remembered that Manchester has gone in somewhat largely for what municipal traders are fond of terming "reproductive undertakings." The gas-works are, of course, to hand over their customary contribution of £50,000; and the consumers are also to benefit by a reduction in price, which they may credit (as far as it will go) to the increase in their rates. Last year, for a special reason, the sum given by the department was £70,000; and it is hardly surprising that, in view of the general estimates, a desire should be expressed in some quarters for a repetition of this feat. It is, however, to be hoped that such a course will not be adopted, if, as appears certain, it would entail the sacrifice of the proposed concession to those who are entitled to the first consideration—namely, the consumers. Already, with their handsome contribution of £50,000, the Gas Department occupy the front rank with the Tramways Committee, who are intending to hand over £46,000 for the relief of the rates, and to pay £4000 interest and sinking fund on the purchase money of the infirmary site. As far as the electricity undertaking is concerned, one looks in vain for a helping hand; the Committee have too much to do with their renewals suspense account to think of assisting the rates. Adding to this the fact that the Markets Committee are decreasing their contribution from £14,000 to £12,000, it will be seen to what a large extent the results of the Corporation trading taken as a whole depend upon the prosperity of the gas-works.

FURTHER EXPERIENCE OF THE WORKMEN'S COMPENSATION ACT IN GAS-WORKS.

THE letter of Sir George Livesey on the working of the accident fund established for the workmen in the service of the South Metropolitan Gas Company, which appeared in last Tuesday's "JOURNAL," calls for notice in connection with the discussion that has been started respecting the cost of insurance under the Workmen's Compensation Acts. The insurance offices have begun it, with a very definite and intelligible object. The Government are pledged to extend the scope of the Acts; and it is the cue of the Tariff Companies to make out the best case they can for the high premiums that they seek to impose upon employers for protecting their interest, which is involved in the new scheme of legislation. Our object in dealing with the matter at the present juncture is to defend the gas industry from these machinations, by adducing proof that, so far as gas-workers are concerned, the experience gained of the cost of carrying out the Act has precisely justified the anticipations of competent appraisers of the risks of this employment. It is to be hoped that the artless way in which the net of the tariff insurance offices has been spread in sight of the bird, as explained in our article on the subject of the 19th ult., will have the proverbial result. There is nothing in the experience gained of the working of the Acts so far as they extend, to deter any Government, bound to have regard equally to the interests of employers and employed, from enlarging the scope of similar provisions. Nevertheless, whenever the question of doing so is debated in Parliament, a good deal of controversy is certain to rage over the moot point of whether the provisions of the existing law should be re-enacted or altered. Assuming the desirability of extension—without pausing for a moment to inquire whether there should be any exceptions to the obligation of the employer to pay compensation to an injured employee—the questions that are sure to be most fiercely contested relate to the matter of "contracting out," and the right to compensation for the first fortnight.

Sir George Livesey's contribution to the solution of all the problems arising out of the operation of the Act in gas-works refers particularly to these two points, which really hang together. It was so intended by the framers of the original Act. The bar placed by the Act upon claims relating to injuries which do not incapacitate the sufferer for more than a fortnight was designed to prevent malingering; to avoid the channels of operation of the Act being clogged by an accumulation of petty claims; and to leave a door open for mutual arrangements whereby workmen might benefit more than they could from the strict letter of the law. Nothing in the Act has been better justified than this provision. It is commonly testified that this wise expedient has stopped "footballitis" in all its forms; while it has obviated the scandal of the House of Lords being called upon (say) to decide disputes about a bruised finger. At the same time, the real hardship and suffering resulting from minor accidents have proved to be powerful levers for the launching of numbers of shop schemes which, for a consideration, give accident pay and proper medical attendance from the very first. An additional benefit of many arrangements of the kind is the improved pension system for widows mentioned by Sir George Livesey. It is worth knowing that, in the South Metropolitan experience, the tale of minor accidents which would not come under the Act, amounts to 49 per cent. in number, and 44 per cent. in money, of the total recorded for the past five years. This statement fairly agrees with the insurance experts' estimate (*ante*, p. 148) of 55 per cent. and 40 per cent. A very gratifying result of the jury system of inquiring into all accidents involving claims upon the funds, as established at the South Metropolitan works, is the positive diminution of the sum-total of accidents by one-third. This fact furnishes a complete answer to the Trade Union assertion, so often heard in and out of Parliament during the debates on the original Bill, that the proposed plan would rather tend to increase the number of accidents than to reduce them. We believe that one of the useful indirect effects of the jury system is to make men ashamed to magnify their injuries, or to prefer petty and unjust claims.

Some additional light on the working of the Acts is supplied by an exhaustive paper just read by Mr. William H. Tozer before the Royal Statistical Society, in which the previous state of the law relating to the right of workmen to compensation for personal injury, and the alterations effected by the Act of 1897, are expounded. Whatever else can be truly said of the character of this amendment of the law, that of being one of the most operative of Acts of Parliament ever passed must certainly be attributed to it. From the commencement of the Act to Dec. 31, 1902, no less than 6400 memoranda of agreement as to payments to workpeople were registered, involving lump sums to the total of £144,328, and weekly payments amounting to £2900. There were, besides, 5483 claims for compensation dealt with by the County Courts, in which lump-sum payments amounting to £234,565 were awarded, and £1340 in weekly payments. Among the curiosities of the law, it may be mentioned that the scale of weekly payments ranges from 1d. and 1½d. to the full prescribed maximum of £1. It is explained that the smaller amounts are not probably intended to be adequate compensation for injury sustained, however slight, so much as to preserve the right to

compensation should a development of injury justify a review of the case. It appears that the average amount awarded by the Courts on the death of a workman leaving dependants was £170, or slightly in excess of the minimum provided by the statute. The amount of the weekly payment may be taken approximately at 11s. per week. These figures do not support the contention of the insurance companies that there has been a notable development of the art of claim-making. With regard to the alleged flood of litigation resulting from the Act, the facts are that the solicitors' costs allowed by the County Courts only amounted to £29,703 for five years. Appeals from the decision of these Courts were made in 397 cases, or 7·24 per cent. of the total number. Nine cases only are reported as having been carried to the House of Lords, seven of which were by workmen or their dependants, and in six cases the decisions of the Court of Appeal were reversed. The gist of these decisions is given by Mr. Tozer; but they need not be repeated here, as we mentioned most of them at the time.

As regards the certified schemes under section 3 of the Act, to which category the South Metropolitan arrangement belongs, it is explained that the essential feature of such a scheme, entitling it to be certified by the Chief Registrar of Friendly Societies, is that it must be, on the whole, not less favourable to the workman than the Act itself. Where such schemes depend upon a joint contribution of the master and the men, it has to be shown to the satisfaction of the Registrar that the contribution of the master is as great as he would have to make under the Act, and that the benefits the workman is to derive from the master's contribution are equivalent to those he would derive under the Act. It is recognized that though masters and workmen have their divergent interests, as all persons who have dealings together must necessarily have, the interest they possess in common is stronger than the causes of division. Consequently, where this common interest tends to the conclusion of a mutual arrangement, the results have always been excellent, in the fostering of mutual understanding and good feeling. It is probably for this reason that the Trade Union Bill for the amendment of the Workmen's Compensation Act, backed by Mr. Joseph Walton and others, proposes to nullify such schemes. As a matter of fact, Trade Union animosity to mutual schemes has failed to stop them, and has equally failed to spoil their beneficial operation. It is recorded by Mr. Tozer that litigation in this connection has been almost unknown. In the disposal of a total income of £557,721, only 1s. per £100 has been expended in law costs—"remarkable testimony to the earnestness of both employers and workmen in maintaining that kindly relationship which it is so desirable should subsist between them." Only one scheme has proved abortive, though (exclusive of the Government proposal in connection with the Admiralty and War Office) those in operation cover 615,895 workpeople, who contribute an average of 7s. 2d. per annum, or slightly more than 1½d. per week. It appears from this figure, when compared with the South Metropolitan rate of 2d. per month, that the gas-workers' occupation is not very hazardous.

Though Mr. Tozer finds that those workmen who participate in certified schemes undoubtedly receive full value for their contributions, he shrinks from giving any pecuniary valuation of the comparative advantages derivable by workmen from such schemes, and from resort to legal tribunals. By far the chief portion of the benefits conferred by the Act is never publicly mentioned at all. As might have been anticipated as regards a measure introducing such entirely new principles into British jurisprudence, the original Act was strongly opposed, on the ground that it would not only ruin many employers, but would also seriously injure the industries of the country. These apprehensions have not been realized. On the other hand, it was thought by some that the consequences of the Act would detrimentally affect the workman to a greater extent than the employer. It has been stated that men are considered too old at 45 years of age to work in some occupations. Employers, realizing the grave responsibility that rests upon them under the Act, even in the most favourable circumstances, are said to be more careful in the selection and retention of workmen. Mr. Tozer has nothing positive to say on this head, beyond the remark that "it is possible that to some extent the preference for younger men is unconnected with the Workmen's Compensation Act, and it is only part of a general tendency to prefer young blood in modern business industry." This is rather a weak conclusion, which somewhat discounts the author's general judgment that the Acts, alike in their ordinary operation and in the alternative offered by what is called "contracting-out," have been eminently beneficial to the working classes. Almost the only plausible excuse left open to the Trade Union agitators for working up public sympathy against the Acts rests upon this accusation. The circumstance of Trade Unions themselves being chargeable with bringing about the same state of things, by their insistence upon the payment of uniform wages for men in the same employment, is, of course, beside the mark. Two blacks do not make a white. The truth probably is that men of inferior health and physique—whether this condition is due to age or other causes—experience an ever-increasing difficulty in keeping up with the procession of the most profitable producers. The Workmen's Compensation Acts probably accentuate this fact rather than cause it.

However this may be, the case of gas workers under the Act is now fairly before our readers. It was opened up by the criticisms of the law that appeared in "The Times," in which the position of the Tariff Insurance Companies was plainly disclosed. We did not think this treatment of the subject either adequate or fair, so far as the experience of the gas industry extends; and now that Sir George Livesey has so clearly set out the facts of the most extreme form of mutuality in this regard known to exist, both sides of the matter may be considered to have been sufficiently exposed. It will be in the light of these independent statements that the further proposals of the Government for the extension of the principle must be judged. Reference has been made, in the course of this article, to a Bill backed by Mr. Joseph Walton and other Labour members of the House of Commons for the amendment of the Act of 1897. It is scarcely necessary to remark that this measure would, if passed, do far more mischief than it could cure. It proposes to make employers liable for all injuries to all workmen from the date of the occurrence; the employer being forbidden to set up a defence to any proceedings instituted for the recovery of compensation, and contracting-out is not to be a bar to the action. The expression "workman" in this Bill "includes every person who has entered into, or works, whether by way of manual labour or otherwise, under a contract of service or apprenticeship, with an employer in the United Kingdom or on board a British ship, whether the contract is expressed or implied, or is oral or in writing." Nothing could be more sweeping or simpler. As a specimen of Labour legislation, the print of the Bill, which is numbered 123, is cheap at the price of a halfpenny marked upon it.

A CHECK ON MUNICIPAL EXTRAVAGANCE.

The warning which the Chancellor of the Exchequer gave to municipal authorities, when introducing his Budget, against the reckless piling up of debt, is not the only sign that the Government takes a serious view of this particular form of extravagance. Last week, the Plymouth Corporation again brought their financial troubles before a Parliamentary Committee, only to find the Local Government Board as sternly determined as last year to exact the utmost penalty for the laxity of control exercised by the Town Council over its borrowing and spending. A year ago, the Corporation withdrew a Bill which they had promoted for the purpose of putting their overdrawn banking account on a legal footing, rather than accept the condition that their future expenditure should be controlled by a Local Government Board Auditor armed with the power of surcharge. The costs incurred in connection with this abortive measure are said to have been £5000, every penny of which was wasted. But this heroic sacrifice has availed nothing. Having withdrawn the Bill, the Corporation were still without the means of obtaining relief from their financial embarrassments. Their overdraft at the bank remained unpaid; and their borrowing powers were practically exhausted. Though the Local Government Board, after an exhaustive inquiry, expressed their willingness to formally sanction a considerable proportion of the expenditure which had been incurred, it was still necessary to obtain parliamentary sanction for some of the things which had been done. Thus the Corporation were in the end compelled to promote another Bill similar to that which they had abandoned a few months before. Now they are in exactly the same position as last year, and must either take what the House of Commons Committee offer, or make up their minds to levy an additional rate of at least 3s. in the pound to pay off unauthorized expenditure already incurred—an alternative which to the overburdened ratepayers is practically unthinkable.

Not the least remarkable feature about the whole business is the very strong line taken by the Local Government Board. This year's Bill was nominally unopposed. By the abandonment of certain contentious matters, the opponents of last year's measure were either conciliated or deprived of their *locus standi*. But though it came before the Committee on Unopposed Bills, the Committee stage was by no means a mere formality. For some reason which was not clearly explained, the Corporation, in introducing the Bill, omitted all reference to an audit. Last year they were prepared to insert a clause empowering the Local Government Board to exercise jurisdiction over the appointment and dismissal of the Auditor of the municipal accounts, and requiring him to report periodically to the Board on the state of the finances. This year the Town Council were willing to go at least as far as this; and they had actually drafted a clause based on the recommendations of the Joint Committee of the two Houses of Parliament which sat to consider the subject of municipal accounts. By what appears to have been a tactical mistake, this clause was not put into the Bill. The omission of any reference to the subject of audit, on the one hand, led members of the Committee to the conclusion that the Corporation were anxious to escape entirely from special audit conditions, which, as they pointed out, was the *crux* of the whole question; while, on the other hand, it strengthened the demand of the Local Government Board for the appointment of a Government Auditor, by enabling their representative to say that the Board had had no opportunity of considering the alternative proposal. The result was that the Committee insisted on inserting in the Bill a clause which was voluntarily adopted by Tunbridge Wells when a Charter of Incorporation was conferred on that town. This clause repeals the sections of the Municipal Corporations Act and the Public Health Act which relate to the auditing of municipal accounts, and enacts that the accounts of

the Corporation and its officers "shall be audited by an auditor appointed by the Local Government Board, in like manner as accounts of an urban authority and their officers," and that the provisions of the Public Health Act "imposing penalties and providing for the recovery of sums" shall apply to the Corporation and their officers. The Corporation have now to decide to either take the Bill or leave it. They may again come to the conclusion that another application to Parliament will result more favourably, and resolve to try another fall with the Local Government Board. The more reasonable course would seem to be to make the best of matters as they stand. If the Government audit places restrictions upon the Corporation's borrowing, the ratepayers, we imagine, will have no cause to complain of it. It will certainly be to their advantage that the affairs of the town should be conducted on ordinary business lines, and that money raised for a certain object should be applied to that purpose, instead of being spent on something entirely different, or used in the reduction of a constantly growing adverse bank balance.

From the Town Council's point of view, the objection to a Government audit is that it restricts the freedom of the municipal authority. Mr. Duke, K.C., M.P., as a representative of Plymouth, put this view strongly before the Committee. To give the Local Government Board power to surcharge members of the Corporation for illegal expenditure would, he thought, "greatly limit interest in municipal work, and aggravate the existing difficulty of getting the men who were wanted for this work." Drawing a comparison between Town Councils and Urban District Councils, Mr. Duke spoke of the degree of independence that a member of a municipal corporation enjoyed towards what certainly was at times a most vexatious interference; and when he was reminded by Mr. J. W. Lowther, the Chairman of the Committee, that county councils' accounts are also subjected to Government audit, he replied that these authorities had a different class of business to discharge. The argument is exceedingly weak, and it certainly made little impression on the Committee. It cannot be said, with any show of reason, that fear of the effect of an audit ever kept out of public life any man with an inclination for that kind of work, and spirit enough to undertake it. It is not only the accounts of county councils which are subject to this revision and control. All other authorities, except municipal corporations, have more or less of it—no doubt greatly to the advantage of the ratepayers. The demand for independence of control ignores the new conditions under which corporations are working. It does not make sufficient allowance for the enormous increase of late years in the spending power of these bodies. Freedom to spend was one thing in the past, when municipal duty was confined to matters of police and sanitation. It is an entirely different thing now that corporations have become great trading bodies, either as monopolists or as competitors with their own ratepayers. A limit must at some time be put to the reckless inclination of public bodies of all kinds to mortgage the future; and if a Government audit of municipal accounts has the least tendency in this direction, it is a thing to be heartily welcomed. Plymouth promises to serve at once as a warning and a precedent.

ELECTRIC LIGHTING MEMORANDA.

The Further Progress of the Marylebone Electric Lighting Scheme—Hints on the Combination of Electric Lighting and Tramway Working—Why Power Stations should be Independent of Lighting—Extravagance in Providing Electric Light for Workhouses.

THE further progress of the Marylebone electric lighting scheme through Parliament and outside has been chequered, very like the early history of these remarkable proceedings. So far as concerns the steps necessary to enable the Borough Council to carry out the order of the High Court, it has been reluctantly agreed among all concerned that compliance will be the best way out of the difficulty. If this acquiescence in a bad bargain means that Marylebone is to furnish for the rest of the kingdom the lesson against rash municipalization, it cannot be helped. Responsible local government implies responsibility for errors of judgment, as well as for other possibilities of freedom of action; and Marylebone must therefore lie in the bed it has made for itself. It is not, however, to be supposed that the passing of the Bill through the second House will not be opposed. There is enough human nature in mankind to give colour to the prospect that noble lords whose town houses are in this part of the West-end, may sympathize very keenly with the woes of the poor Marylebone ratepayers. The opportunity for manifesting this feeling will probably be made by the continuance of the appeal of the Gaslight and Coke Company for a pure and unqualified Bermondsey clause. If so, it is to be hoped that the opinion of the Local Government Board may be had on the point. After all, as the Speaker's Counsel remarked on a recent occasion, the Board are the protectors of the ratepayers even as against local authorities. Meanwhile, publicity has been given to the ultimate result of the negotiations that have been going on between the delegates appointed by the Borough Council on the 25th of January and the Metropolitan Electric Supply Company. It is in the form of an offer by the Company either to supply current in bulk to the distributing plant to be taken over by the Council, or to lease the undertaking. In the former case, the Company's price would be 3d. per unit for the quantity represented by two hours' daily supply during each quarter of the maximum demand made upon the Company in the quarter, and ¾d. per unit for all excess; the average price of the whole of the current supplied in any one year not exceeding 1·7d. per unit. This would be for a 27 years' agreement. Or the Company would take a lease for the same period, on terms which would relieve the Council of all charges for interest and sinking fund (except in respect of costs). These proposals were not approved of by the Electric Supply Committee, who decided to recommend the Council to proceed with the erection of their own generating station and take the whole of the business into their own hands. It would be interesting to know what is the business objection to the first offer, which looks reasonable. Acceptance of the second proposal, obviously, would amount to an admission that all the cost and trouble of the purchase is money and labour thrown away. However, as the Council have decided in favour of the recommendation of their Committee, it would be waste of time to consider any suggestion of a different nature.

Some interesting hints concerning the inside view of a combined electric lighting and power supply undertaking are to be found in a paper recently read by Mr. Edmund H. Hill before the South Wales Institute of Engineers. The writer points out that in many electricity supply systems—apart from what are meant by power companies—the power and traction load has now come to be the larger part of the business. This is especially true of such leading examples as the Liverpool and Manchester undertakings, which are really more committed to their power trade than dependent on their lighting connection. It does not appear, however, that their finances are being correspondingly improved. Not to say anything for the present about the Manchester undertaking, which has notoriously been under a cloud for some time, the case of Liverpool exhibits some striking features. Here, as everybody knows, the tramways undertaking of the Corporation buys its power from the Electricity Department, taking nearly 17 million units yearly at a price which works out to 1·1d. per unit for 1903. This is all very well for the tramways accounts, which accordingly show a gross profit of upwards of 10 per cent. on the capital expended. Out of this the administration is able to set aside the interest on loans, an equal amount for sinking funds (repayment and reconstruction), and an even larger sum for reserve, renewals, and depreciation. Over and above all this, they have the effrontery to contribute £32,000 a year in aid of the general rates! Meanwhile, what happens to the supply concern, which also does the electric lighting? On a capital expenditure of not very much less than that of the tramways, the undertaking makes little more than half the profit; and if anything like an adequate allowance were made for depreciation, both ends would hardly meet. Not for this Committee is it to subsidize the rates. The tramways load is the cuckoo in their nest.

Mr. Hill explains that these combination systems suffer to a greater or less extent from a serious disadvantage, by reason of their having been primarily designed as lighting stations. Being so employed, they have to comply with the Board of Trade regulations as to constancy of voltage. These regulations are most onerous, as they need be if the business is to be satisfactorily carried on. Among other things, they require the pressure at a consumer's terminals to be maintained within a variation limit of 2 per cent. below or above the declared voltage. Even this degree of steadiness is barely sufficient to prevent complaints. The great power distribution companies are free from such restrictions. It has been found that a frequent difference of 10 per cent. in the pressure, above or below the normal, which would make ordinary lighting unbearable, will not appreciably affect the user of the current for power. The better designed a central station is for lighting, according to Mr. Hill, the worse it will be for power. Any attempt to build a station to give both forms of energy equally well, and in equal quantities, will result in a compromise at the cost of efficiency. The ideal power station, according to the best knowledge of the present time, would be equipped with three-phase alternators with a periodicity of 16, or not exceeding 25 in any single case. With the lower of these two periodicities, lighting would, of course, be impracticable; but it would admirably fulfil all power requirements. This is bad news for those electricity-supply concerns which have looked to the power branch for commercial salvation from the disappointments of the older department of lighting. Moreover, it appears that the big power companies have another pull over the smaller stations, in the fact that they are able to do lighting well enough if necessary. A style of lighting which would not be quite satisfactory in a drawing-room will answer for a colliery or for works. Moreover, where a "bulk" connection for lighting purposes can be secured, a power company can rectify their current so as to comply with the Board of Trade regulations. In addition, the big power companies are building much upon the "diversity factor" to give them a high average load; and Mr. Hill thinks they will be able to beat any town station in this respect alone.

It is high time that those central authorities and members of municipal corporations who really have at heart the interest of the ratepayers, should look carefully into the tendency of public bodies having electricity-supply undertakings to make custom for these ventures in the lighting of workhouses and similar public buildings. A good example of this kind of extravagance is furnished in the case of the Rotherham Workhouse, which, according to a curious editorial notice in the "Electrical Times," there was a proposal to supply with electric light at 3d. per unit. This

was a special offer, in view of an estimated use of 30,000 units a year, which would therefore bring in the electricity undertaking a return of £375. Of course, if this method of lighting a workhouse were as good and economical as another, there would be nothing to say against it. But supposing it could be better done by means of incandescent gas, also supplied by the municipality, for half the money, where would be the justification for subsidizing the electricity department by the amount of the difference? This is the point for true public economists to consider. Naturally, our electrical contemporary makes a dead-set against the local gas interest in the case, alleging that municipalities ought not to trade in gas at all, because their interest in the investment "makes them reluctant to allow that anything in which their money is invested can be superseded." The idea of municipal electricity supply superseding gas is an interesting superstition. But, clearly, if local authorities ought not to trade in gas, they should certainly not trade in electricity, in which case a good deal of the provincial electric lighting now provided at less than cost price would be wanting. The real need of the hour is that members of local authorities should judge all these lighting questions on their strict merits. Thanks to the information that has been disseminated in regard to the cost and efficiency of different methods of public lighting, the vogue of electricity for this purpose is passing. But it still clings to some other municipal uses of light in which both economy and brilliancy are objects to be considered; and this is a mere fashion, or prejudice, which is distinctly injurious to the interest of the ratepayer. Why a poor householder who is utterly unable to indulge in the luxury of electric light himself should pay for its use by paupers, is a question more easily asked than answered with any regard for the fitness of things.

PAINTS AND PAINTING FOR GAS-WORKS.

This is the season when the question of cleaning and painting all engineering works and building constructions becomes a pressing one for those responsible for the good keeping of such property; and though the subjects of the rusting of iron and its prevention by means of paints have often been discussed in these columns, the matter is of such perennial interest that there is always something fresh to be said about it. It is well remarked by the "Builder," that the progress of chemical science of late years has not tended to the improvement of paints, nor to the relief of the anxiety of the purchaser and user of pigments and oils. The main result of such progress and expansion as have been made in the chemical and allied industries during recent years has been to largely increase the number of cheap paints placed upon the market. Certainly, the introduction of machinery capable of effecting fine and uniform grinding and mixing of commercial paints, has been an improvement; but this does not appear to be the case in regard to the composition of paints generally. Linseed oil, turpentine, white lead, red lead, red oxide of iron, and the ochres, remain the bases of the best and most durable preservative paints, just as they did fifty years ago. Progress appears to have been made in the art of adulteration, and in the manufacture of inferior paints at low prices; for though such crude trickery as the addition of brick-dust and clay to paints is less common than formerly, it is doubtful whether the trade as a whole is in a better state. The rage for cheapness is responsible for much sophistication of paint mediums, which cost more than most of the pigmentary matters employed to make paints.

Unfortunately, it is observed, paying a higher price for a better article does not always secure the desired object in the purchase of paint, which in this respect resembles many other commodities. Those who deal with firms of poor repute are robbed in various ways; the robbery being in many cases facilitated by the knowledge of the seller that the buyer is not likely to apply even the simplest tests to ascertain whether he has received the article for which he has paid. Thus, linseed oil is commonly adulterated with rosin oil or mineral oil; turpentine with petroleum spirit; and oxides with barytes, chalk, or gypsum. It is asserted that the question of price does not always govern the extent of this adulteration. The following statement on this head is offered on the authority of the "Builder." A recent application to six well-known firms for quotations and samples of pure oxide of iron paint, special emphasis being laid upon the necessity for purity of the iron oxide, resulted in the discovery that in only one instance did the pigment approximate to commercially pure oxide of iron, Barytes was present in some of the samples and in one case rosin and naphtha had also been used. One sample contained 50 per cent. of barytes, and only 24 per cent. of iron oxide; and the pigment was in such a granular condition that when the paint was spread over a smooth surface and allowed to dry, the silicious particles could be felt by the fingers. Another sample apparently contained burnt ochre; and though the paint contained 27 per cent. of silicious matter, and only 34 per cent. of oxide, it could not be said to be adulterated, because it was sold as a "natural" oxide paint, and many natural iron ores contain an even larger proportion of silicious impurity.

It is often contended on the part of the manufacturer, that paints containing certain components which are technically adulterants, are really as good as the unadulterated article. This allegation is sometimes advanced as justifying the representation of the cheap imitation as being the genuine article itself. Buyers are familiar with this excuse for adulteration; but it is sufficient to meet it with the demand that the fact of any admixture should be declared at the time of purchase. The commonest adulterant of pigments is barytes, on account of its weight and appearance of "body." But its presence is never advertised. One of its greatest drawbacks, when present in excess, is to hinder the spreading action of the brush. It also falls to the bottom of the pot. Chemically, it is not harmful. If the paint is to be sprayed on the work, instead of being laid on with a brush, barytes becomes objectionable. For both methods of application, a sufficient degree of liquidity is a good point in a paint. This is a matter that engineers, and particularly engineering assistants, have to ascertain for themselves; because in the ordinary case of works painting, the labour is usually unskilled. Real "tradesmen" are not engaged for the purpose. The handy labourers employed for doing painting work know nothing about the character of the materials. These are best tested by means of slips prepared in advance.

A good paint should dry in a reasonably short time, and remain firmly attached to the surface painted. The dried surface should be smooth, impervious to moisture, and sufficiently elastic not to chip or peel off. If the paint dries badly, or becomes tacky again after first drying, the oil is adulterated. If rosin is present, the dried paint may become brittle. It is very difficult to prescribe any satisfactory means of analyzing a mixed paint for adulterants. The brush test on slips of clean metal is the best guide. This will show, also, if the ingredients of the paint are in the right proportion. An experienced hand can detect, by the feel and the smell, whether paint contains much of the commoner adulterants. The metallic oxides which should form the pigments of red and white lead, zinc white, and iron oxide paints, dissolve almost completely in hot nitric acid—the last named turning the acid yellow. The oil should first be either burnt off or washed out with spirit. Barytes is insoluble in the acid. Really, it is the chief adulterant to look for.

Chemistry, though it has not done anything noteworthy in improving paints, tells us much that is interesting and worth knowing about the essential nature and action of paints as preservatives of ironwork. It is certain, to begin with, that there is no way of stopping the rusting of iron and steel when this has once begun. The rust must be cleaned off as thoroughly as possible before the paint is put on the iron. Experience has also shown that the best paints for protecting ironwork are those in which the basis is an oxide; because then the pigment unites with the fatty acids of the medium to make an actual metallic soap. Some of these metallic soaps—especially those made with oxides of lead and iron—dry to hard, firm coatings. There is also present in the paint medium a proportion of glycerine, which mostly becomes absorbed in the metallic paint. This is the reason why such paints do not require dryers. The absorption of the greater portion of the glycerine by the paint is regarded by some chemists as of the first importance. The glycerine which is not so absorbed remains diffused throughout the mass, and is very hygroscopic. However, such a paint (which results where barytes is substituted for the metallic oxide) is perishable. White lead paint is not so protective of iron as red lead or red oxide of iron paints, being more permeable by water. Apart altogether from the question of its keeping its colour under exposure to sulphurous gases, zinc white goes farther and makes a better iron paint than white lead. A white lead paint is only a mechanical mixture of the oxide with the medium. It spreads and covers well, chiefly because the pigment is in an extremely fine state of subdivision, and is amorphous. White lead is defective as a paint for many applications, because it is so readily attacked by sulphurous gases, which decompose the dried film and eventually perish it. The expense of paint and painting in and about gas-works is considerable; and mistakes in the selection or use of paints are apt to prove both troblesome and costly.

Institution of Civil Engineers.—At the annual general meeting of the Institution last Tuesday, the result of the ballot for the election of Council for the year 1904-5 was declared. Sir Guilford L. Molesworth, K.C.I.E., is the President; Sir Alexander Binnie and Dr. A. B. W. Kennedy, F.R.S., are two of the Vice-Presidents; and among the other members of the Council are Mr. G. F. Deacon, Mr. G. H. Hill, Mr. Alex. Siemens, Sir John Thornycroft, and Professor Unwin. Among the awards made by the Council for papers read last session is a Telford Premium to Dr. H. R. Mill, for his paper on "The Mean and Extreme Rainfall over the British Isles."

An Ill-Founded Hope.—In the "Scientific Notes" of the "Pall Mall Gazette" last Friday, the following paragraph appeared: "On Imperial grounds, we should direct our interest in chemistry at the moment chiefly to the remarkable new mineral which has lately been sent from Ceylon to this country for examination. It is being studied at the Imperial Institute and in Sir William Ramsay's laboratory. The hope that it might prove to be a source of wealth in containing large quantities of thorium—of which incandescent gas-mantles are made—appears to have been ill-founded; but, on the other hand, there seems good reason to believe that its potentialities in other directions are much greater than any one could have guessed. It has already yielded signs of containing two elements hitherto unknown to chemists; and it may well turn out to be the most precious product of Ceylon."

GAS OR COAL IN THE POTTERIES.

THE anticipated advent of Mond gas into South Staffordshire has naturally given rise to inquiries as to the suitability of this fuel for use in one of the main industries of the district—namely, the pottery trade—and investigations made by Mr. G. C. Kent, the Town Clerk of Longton, have revealed some interesting facts with regard to the comparative cost and relative advantages of heating potters' ovens by means of gas and coal. Being unable to secure any really definite information locally as to the capabilities of Mond or other gas in this regard (coal alone having been used in England), Mr. Kent, while on a recent visit to America, approached the matter in another way, by going thoroughly into the results attained there by the use of natural gas for the particular purpose with which he is concerned. Taking the figures thus secured as a basis, calculations have been made with the idea of demonstrating the commercial possibility (or otherwise) of employing Mond gas and ordinary illuminating gas to do the same work. Having taken every precaution to verify his conclusions (in which he was aided by, among others, Mr. W. Langford, of Longton, Mr. W. Prince, of Stoke, and Mr. R. Surtees, of Fenton), Mr. Kent embodied them in a valuable paper which he read last week before the English China Manufacturers' Association. The larger part of the paper, of course, does not specially call for the attention of readers of the "JOURNAL."

The American town visited was East Liverpool (Ohio), which is one of the largest seats of the pottery trade in the States, and is situated about 40 miles from the natural gas fields. In the factory inspected most, if not all, of the ovens had been constructed for firing with coal; but their conversion on the introduction of gas proved a very simple matter. The calorific value of the natural gas (the pressure of which in the main was from 10 to 15 lbs. per square inch) was very high—approximately 1000 British thermal units per cubic foot; and the price charged was 4d. or 5d. per 1000 cubic feet, according to consumption. Taking the quantity required per oven at from 280,000 to 300,000 cubic feet, and the price at 5d. per 1000 feet, this worked out roughly at £6 5s. per oven, which was stated to be pretty nearly the same cost as firing with coal. After fully describing the method of using the gas, Mr. Kent admitted that it was difficult to make anything like an exact comparison between this process and the firing of similar ovens with coal as at present carried on in Staffordshire, or with ordinary or Mond gas as might be possible. Cost, however, he said, was not the only matter to be considered, for gas firing possessed many other advantages over coal—such, for instance, as the ease and simplicity of starting the fire, the absence of dirt, the more uniform character of the fired ware, &c. Even, therefore, if it cost more to fire with gas than with coal, it might still be advantageous to adopt it. Having got so far, it remained to be seen whether, in view of the fact that natural gas is not within reach of the Staffordshire firms, any other form of gas could be substituted, and at anything like a reasonable cost.

So far as coal gas is concerned, a small experimental oven has been erected and fired with perfectly satisfactory results, though no attempt was made to check the cost. But even assuming that the coal gas could be supplied at as low a rate as 1s. 6d. per 1000 cubic feet, it is calculated that 500,000 cubic feet would be required, as against 300,000 cubic feet of natural gas, which would make the charge £37 10s. per oven, as compared with the £6 5s. for natural gas in America. Even this price, however—prohibitive as it is—is probably unattainable in the Potteries under existing conditions, for the reason that the undertakings for the manufacture of illuminating gas would not be able with their present plant and mains to produce and distribute the gas in the large quantities that would be required for a general supply, and consequently extensive capital outlay would have to be incurred, which, as most of the gas-works are in the hands of local authorities, would just now constitute a considerable difficulty. Under these circumstances, while admitting that in course of time improvements and economies may be introduced, Mr. Kent is reluctantly compelled to come to the conclusion that, for the present at any rate, the use of ordinary coal gas must be dismissed as impracticable. How much the author regrets this decision may be gathered from some remarks made by him in reply to the discussion on the paper, in the course of which he said that it was largely with the idea of doing a good turn to the Longton Gas-Works that he had undertaken his inquiry into the subject.

The position of Mond gas does not seem to be any better than that of ordinary coal gas. Taking the calorific value as 150 British thermal units per cubic foot, 2,000,000 cubic feet would be required to do the work of 300,000 cubic feet of natural gas having a value of 1000 British thermal units per cubic foot; and this, at the suggested price of 3d. per 1000 cubic feet, would make the charge £25 per oven. Mond or other producer gas would therefore have to be supplied at a less price than 1d. per 1000 cubic feet to enable it to compete with coal for the firing of potters' ovens; and even assuming that this could be done, there would still remain the difficulty of transporting the gas from the place of production to that of consumption in the enormous quantities that would be required. In this connection, Mr. Kent points out that it cannot be too carefully borne in mind that nearly all the ovens in the district are fired at the same time; so that, while on certain days of the week the consumption would be very small, on other consecutive days it would be so great that the gas could not possibly be produced from central stations as required, and therefore immense storage capacity would be necessary. Considering these facts, he says, it is difficult to see how Mond or other producer gas can, for the purpose named, be manufactured and stored at, or distributed from, large central stations, as is done with illuminating gas; and the conclusions one is irresistibly driven to are that, if such gas is to be made available for potters' purposes, it must (1) be produced at an exceedingly low price, and (2) must be manufactured at or near the spot where it is required to be consumed. Though these two points appear to be antagonistic, the problem ought not, he thinks, to be incapable of solution; and experiments on a practical scale should therefore be undertaken without delay.

We can only hope that when this is done the result will reward Mr. Kent for the large amount of trouble he has taken to draw general attention to what is, in his own district at any rate, an important industrial question.

FROM THE OHIO QUESTION-BOX.

(CONCLUDING NOTICE.)

IN this concluding notice of the volume in which the past year's "Question-Box" work of the Ohio Gas Association is set out with such admirable clearness and fulness, a few of the features of the remaining sections may be glanced at.

Distribution forms the second section; but, on the whole, a study of the questions and answers convinces one that, in the main, their value (such as it is) only lies in the fact that they emphasize what has been emphasized so often before, that practice in many particulars depends upon the conditions of the district, the requirements of the consumers, and the fancies and rules of the road authorities—every set of circumstances largely demands its own special treatment. The manufacture of gas on the one hand, and its use on the other, present their common discussable features; but the intervening methods of dealing with the gas—that is to say, between the works and the points of consumption—in many cases are dominated by such diverse conditions that they cannot be dealt with on an equal level and with profitable exactness. This, however, is not a suggestion that they should be ignored. Far from it. There is much interest in knowing what a fellow engineer does or is bound to do in dealing with his special environment; and his circumstances may fit in with those of some other engineer. The point is that in distribution there is not, there cannot be, the community of circumstances which may be improved by discussing each other's practice and experiences, as in the departments of gas production and utilization; and therefore the value is not so great.

Look at the first question, "Is it customary to compel gas companies to refill their trenches with gravel when a trench or a cut for a service is made under an asphalt pavement?" The answer is "No, it is not *customary*," for the printed replies show the regulations in almost every place to vary. Then there are seven pages of printed matter given up to the question as to whether it is wise to ever use 2-inch wrought-iron pipes for mains. The answer to that must, of course, depend entirely on local circumstances, the outlook, the character of the soil, and so on. Some advocate their use; but the majority, excepting for well-understood reasons and special positions, do not. And the view of the latter is the generally accepted opinion on this side—that the increased first cost of rather larger pipes for mains, considering the unknown future development of consumption, pays in the long run.

A little later a question is found which bears upon the paper read by Mr. Thomas Glover at the recent meeting of the Eastern Counties Gas Managers' Association, as published last week. The inquiry is, "Would it not be desirable for pressure-regulators to be placed on each service, if the cost could be kept below $2 per service?" The first contributor of a reply says unhesitatingly, "Yes, as there is nothing more desirable than a uniform pressure." The second writer points out that it depends entirely upon the variation in the street-main pressure. A third answers that, in his case, they are now delivering gas to regulators placed just before several hundred meters up to 30 lbs. pressure, and in their three years' experience, there has never been an accident. The regulators reduce the pressure to approximately 30-10ths with reliability and accuracy. A further correspondent believes regulators are an improvement, but would not advise their general use as it certainly means reduced consumption. Place them, he says, where you know the pressure exceeds 4 inches maximum, and is so strong as to cause poor combustion in Welsbach lights and breakage of globes and mantles. An affirmative answer is given by another correspondent, provided that perfectly reliable regulators can be obtained that would not suffer much deterioration nor require much attention. The inquiry is also viewed from the standpoint of relative economy in first cost and operating expenses by a well-known engineer. It is easy, he says, to see that where services are very numerous per mile of main, a charge of $2 per regulator, with say 25 c. as an annual operating charge, would make the regulation of pressure by means of a better main system the more economical method. In this connection, it may be interesting to note that in Philadelphia the great majority of

consumers have at the head of services, pressures of 25-10ths, with a variation of perhaps 5-10ths each way in the twenty-four hours. Another contributor does not believe in the use of pressure-regulators under any conditions where they can possibly be avoided, as they eventually are sure to be a source of trouble and annoyance.

Two questions in this section refer to protecting pipes against electrolysis. The replies are given in full in another column. Meters and pressures have been prolific of correspondence; and on the last-named subject, one of the most interesting of the inquiries asks for the best method of increasing the pressure in the farthest lying street-main system during the greatest consumption of gas from early lighting until ten p.m., after which no deficiency of pressure exists. The questioner asks for "*the* best method;" but from the number and character of the answers, it would appear that there are several methods entitled to the superlative description. The simple plan favoured is the use of an exhauster, fan, or high-pressure pump, with a small high-pressure feed main to the point where the greater pressure is required. The pipe can *en route* be used to supply consumers, provided house-regulators are installed. One writer advises the use of a loop of pumping-main about the town, connecting all holders and generating stations, from which feed mains may be carried to the centres of weak points in the district. At the ends of each of these mains, governor stations should be located, consisting of two balance governors in a pit in the street. With such a system, the pressure can be regulated from day to day just to cover the requirements at the weakest end for each hour of the twenty-four. It is difficult to say exactly in what spirit a reply was written which suggested that the questioner should have "a practical man in to make an inspection." A district holder, or high-pressure line, or a combination of both, is recommended by another contributor. In the only answer in which there is any approach to a discussion of the matter, it is remarked that if there is not apt to be, in the near future, any need for enlarging the street main system between the works and the point needing "boosting," it may prove more economical to raise the pressure by laying a special feeding-main of wrought iron for pressures ranging up to 40 or 50 lbs. per square inch, or a larger main of cast iron for pressures up to 80 inches of water furnished by a fan blower, than it would be to get the pressure in the ordinary way by enlarging the distribution system. However, in estimating the relative cost of straight distribution *versus* boosting, one must be very careful to allow enough for contingencies in the latter case, otherwise an estimated saving may prove an actual loss after some years' working of a booster. In most large cities, until the size of the main needed for straight distribution gets very large (say, over 36 inches) and its length very long (say, over three miles), there is, considering the greater uncertainty of the services, nothing very attractive, in this correspondent's opinion, in the booster proposition. Where, he adds, there are in use pumping-mains from manufacturing to holder stations, an excellent opportunity is afforded to boost pressures by feeding direct from these pumping-mains into the distribution-mains at the hours of peak-load.

The remaining sections of the volume must be passed over lightly. The one in which are collected the questions and replies referring to office methods and accounting, is short. Then follows the division in which gas appliance topics are assembled. A brief stop may be made to call attention to the answers to the question, "What is the secret of high efficiency incandescent gas lighting by means of high pressure?" The replies vary. One writer pins his belief to the increased efficiency being due to the delivery of gas in small volume under high pressure resulting in better aëration and greater energy of combustion. Another has an idea that it is owing to the mantle, under high-pressure supply, being thoroughly filled. By a third it is stated that the higher pressure increases the injecting power of the gas—thus increasing the proportion of oxygen. "With an increased supply of oxygen, fewer intermediate compounds are formed, causing a reduction of the space within which combustion is completed—*i.e.*, the flame. As temperature may be generally regarded as heat space, we have an increased temperature resulting in a more intense incandescence of the mantle." A further correspondent holds that gas burned in a Bunsen burner at high pressure produces a much higher temperature than at low pressure. The higher the temperature of the mantle, the greater the percentage of radiation is light and the greater the efficiency. By another writer it is contended that the securing of quick combustion of the gas by means of more rapid and intimate admixture of air therewith, produces a more intense heat—thus making the mantle hotter, and therefore brighter. In the same section there is a little discussion as to the reasons the gas manager finds it hard to introduce gas-engines, even where the price of gas is low. The high first cost of gas-engines in comparison with electric and some other motors stands out prominently among the reasons adduced. Short sections are devoted to new business matters and legal and financial topics. The residuals department, judging from the number of questions unanswered and the fewness of the correspondents, is not such a popular one as those devoted to manufacture and distribution. The concluding divisions of the volume deal with management and miscellaneous topics—all of considerable interest.

These further dips into the book, and into the work of the Editor (Mr. H. L. Doherty), confirm the several impressions to which expression was given in the first article.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 333.)

THE course of things on the Stock Exchange last week was highly gratifying. Confidence was rooting itself more and more firmly; and the public came in, and did a lot of genuine investing. The old times seemed really to have come again. There was a strong demand for gilt-edged and the better class of securities; and there was less of the speculative element at work. Prices rose nicely, but not extravagantly. Business was fairly active, considering it was settlement week; and the account was free from difficulties. The cheerful feeling prevailed right up to the close, and with every prospect of a continuance when the Exchange re-opens to-day. In the Money Market there was a good demand for Stock Exchange purposes and the usual requirements of the season, and rates stiffened accordingly. Discount, too, was harder. In the Gas Market, business opened quiet; but it quickly increased in volume, and became quite active—Saturday being about the busiest day of the week. The tendency was excellent—stocks in general making nice moderate advances that they could justify and maintain; and the last prices were the best. In Gaslight and Coke issues, the ordinary was again in strong and continuous demand. After a little hesitation, in which 92¾ was marked, it went off at a great rate, and finished up by changing hands at 95¾; the quotation being two up. The secured issues participated in the buoyancy; and the preference gained a point. South Metropolitan had a more active week, and improved materially; the opening bargain being at 123, while on Saturday the price of 126 was touched. In Commercials, a few bargains in both issues were marked at rising figures. In the Suburban and Provincial group, very little business was recorded; but quotations were all on the rise. Alliance advanced a half; and Tottenham "A" improved three points. At the Mart, £12,500 of the "B" stock was disposed of at a little better than par; and at an equivalent valuation, the "A" would bear a considerable further rise. Business in the Continental Companies was decidedly quiet; but prices were better. Imperial was marked "specially" at 207; and Continental Union had a further recovery. In the remoter world, the Argentine Companies maintained the activity they have been showing for some little time past, and had further advances. Bombay new also had a further rise. In Water, there was some little revival of activity; and many issues were moderately dealt in. The position generally was steady; the only movement in quotations being a small advance in Lambeth.

The daily operations were: Business in Gas was quiet on Monday; but with a strong tendency. Both Unions advanced 1, and Alliance old ½. Tuesday was busier, and prices were steady. Tottenham "A" rose 3. On Wednesday and Thursday, transactions increased materially, and prices were very good, though quotations did not move. Friday was an active and buoyant day. Gaslight ordinary and preference rose 1 each; and Buenos Ayres ¼. Lambeth Water gained 2. Saturday was very strong and active. Gaslight Ordinary and South Metropolitan advanced 1 each, and Bombay new ¼.

Junior Gas Association for Scotland, Glasgow and West of Scotland Branch.—Intending members of the Glasgow and West of Scotland Branch of the Junior Gas Association for Scotland are invited to be present at a meeting to be held in the Technical College, Bath Street, Glasgow, next Saturday, at 6 p.m. The following items of business appear on the *agenda:* (1) Formation of Junior Gas Association. (2) Draft of Rules. (3) Election of office-bearers in Glasgow branch for 1904-5.

Masonic.—At the Grand Festival of the United Grand Lodge of England, held last Wednesday, Bro. Herbert F. Burrows, of Liverpool, was invested by the M. W. Grand Master as one of the Grand Deacons for the year. Bro. Burrows has taken a prominent part in West Lancashire Masonry. He is a P. M. of the Croxteth United Service Lodge (No. 786), a Founder and First W. M. of the Imperial Lodge (No. 2711), and a Past Prov. G. Deacon of the Province. He is the Honorary Treasurer of the West Lancashire Alpass Institution for Widows of Freemasons, and is also one of the Honorary Secretaries of the Masonic Committee formed for the building of a Lathom Memorial Chapter House in the new Liverpool Cathedral. Last week's "Freemason," in addition to giving the foregoing particulars of Mr. Burrows's masonic career, mentions that he was initiated in the Lorne Lodge (No. 1347), Sutton, in 1881; in 1889 he was elected a joining member of the Croxteth United Service Lodge; and in 1898 of the Lathom Lodge (No. 2229), Southport. He is also a Royal Arch Mason, having been exalted in the Sefton Chapter (No. 680), Liverpool, in 1890, and installed in the chair of First Principal *Z.* in 1896. In 1893 and 1894 he served as Prov. G. D. C., and in 1897 was appointed Prov. G. Scribe N. He has served as Steward for, and is a Life Governor of, the three Central Masonic Institutions, and likewise of the four which have been established by the Brethren of West Lancashire. We feel sure that Mr. Burrows's many masonic friends will appreciate the well-earned distinction now conferred upon him.

PERSONAL.

Mr. W. H. Newton, Assistant to Mr. G. Stevenson, of Long Eaton, has just been appointed Manager and Secretary of the Alfreton Gas Company. Mr. Newton was articled to Mr. John Andrews, of Langley Mill, and has been at Long Eaton nearly two years.

The Leicester Town Council had under consideration last Tuesday a recommendation from the Gas and Electric Lighting Committee that the salary of the Engineer (Mr. Alfred Colson, M.Inst.C.E.) should be increased by £250 per annum, and that the addition should be charged to the Electric Lighting Department. They pointed out that it was nearly thirteen years since Mr. Colson received an advance in his salary, although in the meantime the gas undertaking had doubled in magnitude, in addition to which his duties and responsibilities had been considerably increased by the work devolving upon him in connection with the management of the Electric Lighting Department. Having regard to these facts, and to the highly efficient manner in which Mr. Colson had discharged his duties, as well as to the financial success which had attended both undertakings under his management, the Committee submitted the recommendation. After some discussion, the increase was granted by the casting vote of the Mayor (Alderman Sawday), who said he had never had less hesitation in voting for a rise than in this case.

A STUDY OF SOME AMERICAN GAS-WORKS.

By A. J. Walker, of Leith.

During a visit which I paid to the United States and Canada last year, I saw no signs of gas undertakings being done away with there—in spite of electric lighting. On the contrary, there were rumours in many places of proposed completely new gas-works, or at least of great extensions of those already existing; and in some cities—Milwaukee, for instance—the new works were already very much in evidence. The gas managers I had the pleasure of meeting all seemed to be very much interested in the works which were then in progress in this country; and those contemplating the erection of coal-gas works or installations were evidently deliberating whether they should introduce horizontal or inclined retorts. On this point, I was sometimes interrogated; but, unfortunately, I could only say then, that while some eminent gas engineers here were busy erecting works containing inclined retorts, others were, in like manner, putting up works with horizontal retorts, and some others, again, equally well known and respected, had been observed pulling down settings of inclined retorts they had already built and tried.

I had always heard that Americans were in the habit of asking strangers a great many questions; but I did not really find this the case. On the contrary, everyone seemed pleased to give information; and I am just a little afraid that I did most of the questioning myself. In three of the cities visited, there were signs of strikes, or threatened strikes, of workmen at the gas-works; and I think managers of like undertakings in this country may be thankful that the "walking delegate" cannot swim across the Atlantic.

Connected with some of the undertakings there are splendid offices and show-rooms for gas appliances—far superior in appearance to those generally seen here; and the use of gas for cooking and heating is evidently being very much pushed in some places. In connection with one large undertaking, I was informed that there had been the extraordinary increase of 25 per cent. in the consumption of gas in one year through advertising and pushing. Steam, hot water, or hot air, is, of course, almost necessary for heating in some places in the dead of winter; but gas-fires in addition are found convenient in private houses, as they can so easily be lit for an hour or two at a time when the weather is not quite so cold. The cookers and gas-fires displayed are generally of quite a different type from those in use here—I think less cast iron is used in their construction.

The superintendent of one of the first works I was shown over in Manhattan, when informed of my intention of visiting some of the principal gas-works in the eastern part of the United States and Canada, said that I would see a great many things in American gas-works which had been tried and found wanting, and which I should take a note of only to avoid, but that I would also see much that might be copied with advantage in the part of the world from which I came. Three months afterwards, when I had seen over about two dozen American works, I considered his prophecy had been sufficiently fulfilled.

In the United States, as is well known, a much greater proportion of carburetted water gas is used than we are accustomed to here; and in all the cities I visited in the States and Canada, except one, I found this kind of gas being manufactured in large quantities, though a proportion of coal gas was generally being made and mixed with it. Judging from what I saw and heard, it seems probable, however, that, in some districts at any rate, the proportion of coal gas manufactured will be considerably increased in the near future.

As the manufacture of carburetted water gas was only seriously taken up in this country after it had been pretty well perfected in America, we have, fortunately perhaps, been spared having all the processes which are still being employed in some of the works there, tried in our works here. In some gas undertakings, two or three of these methods of manufacture were being carried on, at the time of my visit, along with the manufacture of coal gas. In one of these—the Wilkinson—blue water gas, produced in generators of the Tessié du Motay type, is passed into a relief holder, from which it is taken and mixed with naphtha vapour in iron chambers heated by steam. The naphtha drops on sloping shelves or trays, under which there is a system of steam-pipes. The mechanical mixture of blue gas and naphtha vapour thus produced is then fixed by passing it through ordinary fire-clay retorts, similar to those used in the manufacture of coal gas, about 20 feet long. The heat required for fixing is regulated by passing more or less gas through each retort, and is judged by noting the colour of the vapour. By this process, it is said that a very uniform quality of gas, as regards illuminating power, can be produced; but I understand the Wilkinson process is being generally done away with—partly owing to the space occupied by the fixing retorts, and the expense of keeping them heated (there being no coke available for firing in most works), but chiefly, no doubt, because it is becoming difficult, if not impossible, to obtain suitable oil or naphtha.

In another process, which, by some, is considered more economical than the foregoing, and which I heard called the Tessié du Motay process—it is probably a modification of that system—the blue water gas manufactured in similar generators, and passed as before into relief holders, is afterwards enriched with oil gas manufactured in ordinary coal-gas retorts about 20 feet long. A tube, about 6 inches in diameter, passes through each of these retorts, which are maintained at a dull red heat. Oil and steam are blown together through these tubes; and the oil vapour thus generated, and issuing from the far end of the tubes, is fixed in passing back through the retorts. White paper or cardboard diagrams, divided into spaces corresponding with the numbers of retorts in each oven (generally six), are used for testing the colour of the gas stain at the top of each ascension pipe—a fairly brown stain indicating the right quality of gas. The retorts I saw used for this purpose were heated with waste oil taken from the drips or syphons in the works. The oil is blown into the furnaces with steam or compressed air. In one large works, I found this process was being temporarily introduced in place of Wilkinson's, for which the gas oil being supplied could not be used.

As no oil is allowed to be run into the rivers, all waste oil has to be carefully freed from water, so that it may be utilized. There is generally a large quantity of lamp black and tar in the mixture produced; and it is found that when these are removed the water readily separates from the oil. A good deal of ingenuity is therefore exercised in getting rid of the tar and lamp black—filters or presses of canvas being used for the purpose. The waste oil, when freed from water, is employed in the furnaces before referred to. In a large works in Chicago, I also saw an example of Pratt and Ryan's apparatus, in which the generator, carburettor, and superheater are combined in one shell.

Of course, water-gas plant of the Lowe type in various stages of evolution is also common; a very good early example being found in the Cantin Station of the Consolidated Gas Company at Baltimore, standing in complete working order as built about 25 years ago. The sets are, or were, comparatively small, and had no separate carburettors; the oil being merely sprayed on the top of the hot fuel at the proper time. The generators and superheaters were built without iron casings; and I was informed that there had been very little outlay on repairs since the works were constructed. This plant was still doing good and economical work.

Nearly all these processes are now, however, quite out of date; and all plant lately put down for the manufacture of carburetted water gas would appear to be similar to what may now be seen in many gas-works in this country—except that in most cases it is much more extensive. In some large installations, there are now two generators to each set of carburettor and superheater.

It is worth noting that, in the United States, an American variety of anthracite coal is generally used in the manufacture of water gas, and not coke as in this country. This is not because the coal is intrinsically more suitable, but for the simple reason that cheap coke is not available, owing to the small proportion of coal gas manufactured.

When mentioning coals, I may say that I understand this is usually bought for gas-works in the United States by the English (or long) ton of 2240 lbs., and that gas-works statistics there are calculated on this basis, though coal and coke are retailed by the short (or United States) ton of 2000 lbs.

A PLEA FOR ONE PRICE.

By Norton H. Humphrys, Assoc. M.Inst. C.E., F.C.S.

Every now and then an attempt is made to arouse sympathy and interest on behalf of a simpler and more rational arithmetical system, in which weights and measures are expressed in fractions of ten; and the advantages of such a system as compared with our various units—including multiples or fractions of all sorts, from 6 up to 500—are all set out with considerable force

and eloquence. These efforts usually fall flat with English readers; and it is more than probable that a similar fate awaits the present deliverance, which is a plea, not in favour of metres and litres, but of one price.

Why is it, if, as an engineer, I want to buy any materials or appliances for the purposes of my business, the chances are that I do not get a plain statement of the price? Supposing the goods are sold at £47 10s. Instead of a plain statement—

To goods	£47 10 0

The bill will probably run like this:

To goods	£100 0 0
Discount, 50 per cent.	50 0 0
	£50 0 0
Less 2½ per cent. for cash . .	2 10 0
Total . .	£47 10 0

involving two arithmetical calculations before I can arrive at or check the accuracy of the price. This is a simple illustration of the point; but it is no unusual thing to have second or third discounts, or advances, to deal with, together with uneven gross prices, instead of the level £100.

Many who read these lines are in the habit of sitting down once a month to examine and pass for payment a pile of bills representing the purchases necessary for carrying on the operations of a gas company—including coal, oxide, lime, fire-clay goods, iron, tools, meters, wrought-iron pipe, stoves, appliances, pendants, brackets, the numerous items known as "fittings," and many other details. There are not only a great variety of weights and measures, but all sorts of discounts and rebates, ranging from 1¼ up to more than 80 per cent. The labour of effectively checking the items is not only unnecessarily increased, but in some instances is well-nigh impossible. In some few instances a sort of custom of the trade appears to have been established, which simplifies matters a little; but in most cases it is difficult to trace any connection with law or order, even in regard to any one line of goods. Brass pendants are quoted at discounts ranging from 10 up to 50 per cent.; and the same as regards stoves and appliances. Why should the discount on a stove be different from that on the utensils to be used with it, or the rebate on half-a-dozen wrought-iron plugs be higher than that on 1000 feet run of pipe? Several of the bills include three or four rates of discounts, and an immense quantity of memoranda is necessary before the correctness of each item can be properly certified.

In addition to the trade deduction, the price is further complicated by the questions of terms of payment. I take it for granted that most gas companies pay cash monthly, as, if they require the "ready," they can get it on much more advantageous terms from bankers or financiers than from individual tradesmen. Yet the business conditions of to-day are greatly hampered by the fact that every tradesman is also a money-lender. Very often his prices are calculated on the basis of a six or a twelve months' loan, usually called "credit," on terms that would not always be acceptable to a *bonâ-fide* money-lender. The "cash price," as it is generally termed, is what I refer to as the price of the article. Any addition or loading to cover credit is really a separate and additional transaction, and should be distinctly treated as one.

Having more or less satisfactorily disposed of the discounts proper, there is the cash rebate to be reckoned with, which is usually 1¼, 2½, or 5 per cent. The tyro might look for some assistance in this respect from certain terse notifications which are scattered indiscriminately over the top, sides, or the foot of the bill, or perhaps in the form of adhesive tabs, which can be omitted or altered as prudence may dictate. I refer to such legends as "Terms Cash," "Strict Net Cash," "Net Cash Monthly," "No Discount Allowed," "Interest Charged after Three Months," and so on. It might be supposed that the object of this information is to give some idea of the terms on which business is done. But they are never taken seriously, and are usually "more honoured in the breach than the observance." The expert buyer simply ignores them, and unhesitatingly knocks off 2½ or 5 per cent. from the bill bearing the words "Strict Net Cash," or takes twelve months' credit on another headed "Interest Charged after Three Months," without adding the nine months' interest that would appear to be due. Often he is encouraged rather than otherwise by the complacent seller in ignoring one or all of the regulations.

The only object of publishing such regulations is presumably that they will be strictly adhered to; if otherwise, the sooner they are removed the better for the dignity of the firm. Sometimes we are told that they are merely safeguards—a sort of rod in pickle for the unruly class of buyers, not intended to be applied to the respectable and well-behaved. But it is rather doubtful whether a regulation could be forced in one particular case if proved to be ignored in a general way. Some sharp buyers lop off 2½ or 5 per cent. indiscriminately on all purchases; and some sharp sellers put on the 2½ or 5 per cent. on the chance of its being taken off.

Under usual conditions of business, it is necessary, in close buying, to specify the terms of payment. But matters would be greatly facilitated if the cash price and not the credit price were stated; and if credit were taken, the interest could be added. Sentimentally, it is simpler to refuse a 2½ per cent. rebate than to add 2½ per cent. interest; but practically the result is the same. The cash price plainly stated saves much trouble to prompt payers; and they are entitled to claim first consideration.

But there are two other matters connected with the price, in addition to checking the arithmetical accuracy, and these are the comparative value and the selling price. If the cash price is stated in one item, both of these are very simple; but under every-day conditions they are the reverse. The comparison of goods priced at 50 per cent. off, with similar articles priced at 15 per cent., involves two separate calculations before we can ascertain which is really the cheaper. As regards selling price, in theory this is shown by the "gross," while the "net" gives the buying price. But how often is this borne out in practice? In the case of goods at below 20 or above 40 per cent. discount, a third calculation is necessary to get at the selling price.

I have often asked: "Why all this confusion of discount?" or "Why cannot there be one fixed rate in regard to any one line?" But I have never been able to get a very definite answer. The general impression seems to be that the established system is an integral part of the established trade, and consequently does not admit of alteration. The 50 per cent. discount is said to suit the foreign or export trade. This may be so, but it does not suit the home trade; and, on the face of it, there does not appear to be any valid reason why buyers in London should be forced to deal under the same terms as buyers in Timbuctoo or Japan, when these are a distinct inconvenience.

Some one has computed how much time and ink are wasted in London every day by the use of such superfluous words as "Dear Sir" and "Yours truly" in business correspondence. The waste caused by the elaborate discount system extends beyond waste of ink and paper, and includes loss of time involved in making and in checking a number of superfluous arithmetical calculations. To some extent this matter has been met by buying on fixed quotations at net prices—terms of payment being specified. Most of the coal used in gas-works is bought on these terms. If this system cannot be made universal, I do not see why it cannot be largely extended to the advantage of both parties concerned. My short suggestion is that the cash price should be put down in plain terms; and that where financial accommodation is required, the terms on which it is provided should be stated as a separate and distinct transaction.

ONE OF THE BECKTON GAS-WORKS PIERS.

At the Meeting of Students of the Institution of Civil Engineers last Friday week—Mr. JOHN J. WEBSTER, M.Inst.C.E., in the chair—a paper on "No. 2 River Pier of the Beckton Gas-Works" was read by Mr. ARTHUR TREWBY, Stud.Inst.C.E. The following is an abstract of the paper:—

The new pier was begun in 1892; and the work connected with the pier itself was completed in the autumn of 1894. It is situated between the old pier and the timber jetty belonging to the London and St. Katherine's Dock Company—a clear waterway of 300 feet being allowed in each case. The pier is T-shaped; the length along the front being 725 feet, and from the river wall to the front 320 feet—the width being 45 feet and 30 feet respectively, It rests on 39 cast-iron cylinders, 6 feet diameter at the top, with a taper enlargement bringing the diameter up to 8 feet for the cylinders along the head of the pier, and to 7 feet at the cutting edge for those in the approach portion.

There is a double deck to the pier for a distance of 170 feet along the front; the lower deck being used for men's lobbies, workshops, &c. The cylinders are connected together with single plate-web girders; the cross girders being of the lattice type. The flooring is Hobson's flooring, of wrought iron, and is covered with a minimum thickness of 6 inches of concrete. Two lines of rail run along the approach portion, and three lines along the head, as well as two lines for the hydraulic cranes. Six openings for hydraulic capstans are formed in the upper deck.

The pier is protected at each end of the head by dolphins, connected together by lattice bracing girders. The abutment is built of brick with a stone coping; the foundation being concrete carried down into the gravel. The cylinders were sunk by the pneumatic process about 45 feet below Thames high water, into the chalk, which was penetrated for a few feet. When the cylinders had been concreted up, they were tested to a load of 350 tons for the small cylinders and 500 tons for the larger ones; the average subsidence under test being 4 inches.

The hydraulic installation at first consisted of three sets of pumping-engines, two accumulators, ram 17 inches diameter and 17 feet stroke, giving a hydraulic pressure of 750 lbs. per square inch, and four cranes with fixed jibs. Four more cranes were subsequently added with derricking gear in 1895, and another four in 1897. Another accumulator was also added; the ram being 24 inches in diameter, and the stroke 24 feet. The cranes revolve on a table on six wheels, and are capable of lifting a load of 50 cwt. 60 feet high, and turning a quarter of a revolution in less than a minute; the consumption of water for each complete operation being 42 gallons.

The reading of the paper was followed by a discussion, in which Messrs. H.O.H. Etheridge, H. W. FitzSimons, H. B. Gates, C. W. Gibbs, E. D. Kibble, E. Latham, and H. M. Rootham—all Students—took part.

NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.

Half-Yearly Meeting at Newcastle.

The Fifty-Fourth Half-Yearly General Meeting of the Association was held in the County Hotel, Newcastle-on-Tyne, last Saturday—Mr. F. P. TARRATT, of Darlington, the President for the year, in the chair. In view of the excellent fare which was offered, there was a large attendance.

Letters of regret for inability to be present were read by the Hon. Secretary from Mr. H. E. Jones, President of the Institution of Gas Engineers; Mr. H. Townsend, President of the Manchester District Institution of Gas Engineers; and Mr. J. H. Troughton, President of the Eastern Counties Gas Managers' Association. There were also telegrams to the same effect from one or two members.

TECHNICAL INSTRUCTION.

The HON. SECRETARY (Mr. Herbert Lees, of Hexham) read he following report on this subject:—

In pursuance of a resolution passed at the last general meeting, held at Darlington on Saturday, Oct. 3, 1903, your Committee proceeded to appoint a Special Committee to deal with this question. For this special purpose, the Committee co-opted the following gentlemen to act with them: Messrs. W. Hardie, C. Dru Drury, W. Doig Gibb, and T. Hardie. A meeting of the Committee was held at the Gas Offices, Newcastle-on-Tyne, on Saturday, Oct. 10, 1903. Mr. A. M. Ellis, the Principal of the Rutherford College, attended, and explained the position of the College authorities in respect to the conducting of a class on the subject of "Gas Manufacture." He also recommended the Committee to suggest a teacher for the class, and to appoint a representative on the Special Sub-Committee for technical subjects at the Rutherford College. The Committee agreed to guarantee a sum of £20 towards the expenses of the College for the first session, and decided to make an appeal to the local Gas Companies and Corporations to raise the amount. The response to the appeal was that a sum of about £15 15s. was received. The balance of £4 5s. required to make up the guaranteed amount has been provided from the funds of the Association. The Committee recommended Mr. Herbert Lees, of Hexham, as teacher, and elected Mr. W. Hardie, of Tynemouth, to represent the Association on the Special Sub-Committee on technical subjects at Rutherford College.

The PRESIDENT proposed the adoption of the report.

Mr. W. HARDIE (Tynemouth), in seconding the motion, said that at the last meeting of the Association there was a very strong feeling that they ought to do something to get classes upon "Gas Manufacture" started in their district. He was pleased to see that this had been done. He did not remember, at the moment, the number who had attended the classes; but it was very considerable—he thought something over twenty. The classes had been carried on in a most successful manner; and he thought they would be a great benefit to the rising generation in connection with the gas industry. At their last meeting, it was found that the classes could not, from the fees of the students, be self-supporting; and therefore it was felt the Association should help on the work, and guarantee a sum of about £20 towards the inauguration of the scheme. This had been done; and the Committee had been able to get a portion of the amount from the local gas companies. It was found, of course, that the Association could not afford to bear a strain like this. He would just like to say that he thought, in a matter of this kind, it was desirable that the Association should support the classes in the manner which had been done; and to his mind it was not asking too much, when they looked at the individual companies who were represented in the meeting, that they should provide some of the funds for carrying on the work. Some of them might say that they could not reap any immediate benefit to themselves from a general scheme of the kind, and that therefore they should not support it; but he thought this was taking a very narrow view of the subject. The fact was that in this country they had been very much behind in the matter of technical education. This had been greatly against their own particular industry; and he considered that, when this scheme had been started, and seeing there was a fair chance of carrying it on, they should do their best to try to get some support from the owners of gas-works. Therefore he hoped that, if it were necessary in the future to do something similar to what was done last year, they might get more support than they had received.

The report was adopted.

NEW MEMBERS AND ASSOCIATES.

The following gentlemen were recommended by the Committee for admission to the Association:—

Members.—Mr. H. Wilkinson, Secretary of the Harrogate Gas Company; Mr. R. G. Fleming, Tudhoe and Sunderland Bridge Gas Company, Spennymoor; Mr. W. Lockey, Alnwick; Mr. C. H. Abby, Shirecliffe; Mr. C. Turnbull, Secretary, Gas Company, Alnwick; Mr. A. H. Bagshaw, Hendon Gas-Works, Sunderland; Mr. G. W. Young, Bishop Auckland; and Mr. G. S. Sayner, Harrogate.

Associates.—Mr. J. E. Morfett, Sunderland Gas Company; Mr. Aaron Bell, Morpeth; Mr. J. M'Nicholl, Hendon Gas-Works, Sunderland.

On the motion of the HON. SECRETARY, seconded by Mr. A. B. WALKER (Walker and Wallsend), the recommendations of the Committee were adopted.

THE ANNUAL ACCOUNTS.

The PRESIDENT said he had great pleasure in proposing the adoption of the accounts of the Association for the past year. The members would see that they began the year with a balance of £48, and that the amount now in hand was just over £30.

The HON. SECRETARY seconded the proposition, and it was agreed to.

THE AFFILIATION QUESTION.

The PRESIDENT called upon the Hon. Secretary to read the following report on the subject of affiliation with the Institution of Gas Engineers:—

It will be well known to the members that this question has been under consideration since the last general meeting; and the Committee now wish to put before you the steps that have been taken by them in the matter. [The Hon. Secretary read the correspondence which had passed between him and the Secretary of the Institution of Gas Engineers on the subject.] The last letter of the Secretary of the Institution came before your Committee at a meeting held on the 16th of January, and, after full consideration, the following resolution was unanimously adopted: "That, before this Committee can make any definite recommendation to the members upon the question of this Association affiliating with the Institution of Gas Engineers, it will be necessary to have full particulars of the Institution's scheme before them." In communicating this resolution, the Secretary was instructed to say that the Committee had every sympathy with the proposal to affiliate the District Associations with the Institution of Gas Engineers, but could not recommend to its members any scheme which would necessitate any interference with the constitution or management of this Association. Subsequently, your President was invited to join a Special Sub-Committee of the Institution of Gas Engineers, appointed to deal with this question. A meeting of that Committee was held on the 7th of April; and, in the unavoidable absence of the President, the Hon. Secretary attended the meeting. The outcome of that meeting, and of a meeting of the Council of the Institution held later, is embodied in the correspondence. Your Committee now recommend that this Association agree to the scheme of the Institution of Gas Engineers for the affiliation of District Associations as set forth in the resolutions adopted by the Council of the Institution held on April 17, 1904.

The PRESIDENT said he did not know that it was necessary for him to go into the question, as it had been pretty well thrashed out at meetings of Gas Associations during the past six months, and as the scheme set forth by the Council of the Institution did not bind them in any way, or alter their constitution, which was the point some of them feared. No doubt there were great advantages to be obtained by joining or becoming affiliated with the Institution, from the mere fact that they would be bound more closely together, as representatives of the gas industry. He had pleasure in proposing that the report be adopted.

Mr. E. E. J. ANDERSON (Middleton) said he had much pleasure in seconding the motion. He considered it would be a great benefit to gas managers that they should be affiliated, as it would give them direct representation on the Council of the Institution, which was a thing they very much needed.

The PRESIDENT said he assumed he might take it that it was the members' wish that the Association should adopt the scheme which had been set forth.

This was agreed to.

RECENT EXTENSIONS AT THE TYNEMOUTH GAS-WORKS.

Mr. A. CLEMENT HOVEY (Tynemouth) read a paper supplementary to the one he gave at the half-yearly meeting at Darlington last October, on "Recent Extensions, &c., at the Tynemouth Gas-Works, North Shields,"* the discussion upon which was then adjourned to this meeting.

The Committee of this Association have requested me to make a statement with reference to the paper I had the honour of reading to you in October last, upon the "Recent Extensions and Working Results at the Tynemouth Gas-Works, North Shields." Perhaps some particulars of working results obtained during the complete financial year ending Dec. 31, 1903, given in such a form that they may be compared with the results obtained in the old section of the works, will be of interest to you. The working costs relating to carbonization given in my paper were based upon those of the first half of last year. Certain charges against machinery were partly estimated, assuming that the whole of the retort-house was doing full duty for 200 days per annum, and the capital charges given were upon the capital that would then be expended. The working results now given are those actually obtained during the year, and the capital charges, &c., are taken upon the whole of the machinery erected. The retort-house will ultimately contain twenty-four settings of eight retorts (22 in. by 16 in. by 20 ft.) each. But only twelve sittings have been erected;

* See "JOURNAL," Vol. LXXXIV., p. 33.

and all these were at work together for five months of the year. The minimum number working was six. The machinery used at present in connection with the twelve settings is of sufficient power to serve the twenty-four settings when erected. All the engines are in duplicate, and the spare parts for machinery are in stock.

Comparison of Costs of Carbonization at the Tynemouth Gas-Works, North Shields.

No. 1. Section Works. Coals carbonized, 35,805 tons during the year. All Hand Work. Maximum, 20 direct-fired and 4 Regenerator settings. Minimum, 8 direct-fired and no Regenerator settings.	Per Ton of Coal. s. d.	No. 2. Section Works. Coals carbonized, 33,072 tons during the year. Machinery throughout. Maximum, 12 regenerator settings of 8 retorts. Minimum, 6 regenerator settings of 8 retorts.	Per Ton of Coal. s. d.
Foremen	0 1·760	Foremen	0 1·660
Stokers	3 4·672	Machinemen, attendants, and firemen	1 5·228
Coal tippers	0 0·854	Coal tippers	0 0·646
Coke trimmers	0 1·606	Coal, and coke machinery men	0 2·251
Stopped pipemen	0 1·867		
Cost of above labour	3 10·759	Cost of above labour	1 9·785
Carriage of breeze to boilers	0 0·217	Carriage of breeze to boilers	0 0·248
Engine and boiler men	0 1·980	Engine and boiler men	0 2·166
Total cost of above labour	4 0·956	Total cost of above labour	2 0·199
Stokers' tools repairs	0 1·210	All charges against machinery as per table, including interest on capital.	0 9·310
Total for hand work section	4 2·166	Total for machinery section	2 9·509

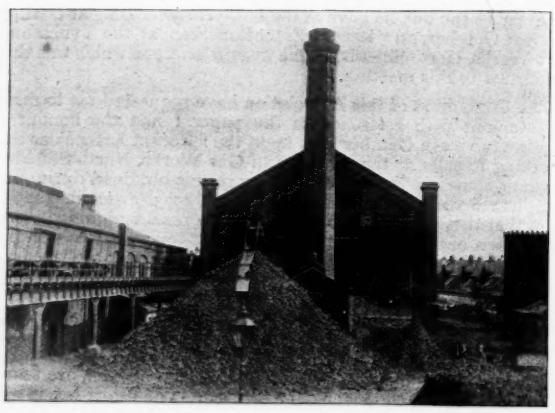
Summary.

Total for hand-work section	4s. 2·166d.	per ton of coal carbonized
,, machinery ,,	2 9·509	,, ,,
Total reduction of cost in No. 2 section	1 4·657	,, ,,
Labour on stopped pipes No. 1 section	0 1·867	,, ,,
Net profit due to coal, coke, and stoking machinery	1 2·790	per ton of coal carbonized

By the prevention of stopped pipes in No. 2 (new) section works, the amount (1·867d. per ton of coal) saved, must be deducted from the total reduction of cost of carbonization per ton of coal in the new section, to obtain the net profit (1s. 2·79d. per ton of coal) due to machinery. The surplus profit—after all charges, including interest at 4 per cent. per annum on the capital outlay, have been paid—is sufficient to liquidate the cost of machinery and the extra cost of buildings in 5½ years.

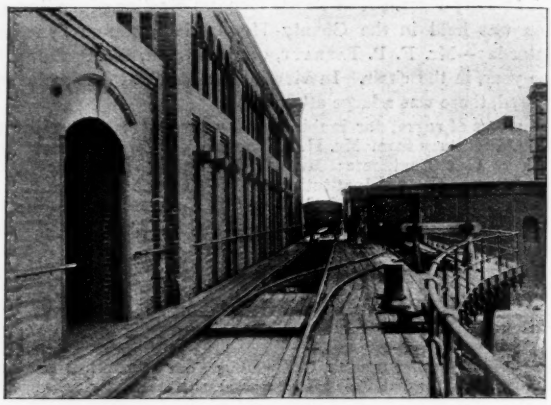
Details of Charges against Retort-House Machinery.

Title of Charge.	Per Ton of Coal Carbonized. Coal and Stoking.	Coke.	Total Machinery.
	d.	d.	d.
Gas for engines (1s. per 1000 cubic feet	0·42	0·23	0·65
Breeze for boilers	0·19	—	0·19
,, (Loss on coke owing to extra breeze made)	0·56	0·56	1·12
Oil and cotton waste	0·31	0·65	0·96
Repairs (renewals)	0·58	0·68	1·26
do. (wages)	1·23	0·41	1·64
Total as above	3·29	2·53	5·82
Interest on capital at 4 per cent., including extra on buildings	2·45	1·04	3·49
Total of all charges	5·74	3·57	9·31



Coke Yard—Equal Quantities of Coke brought out of the Retort-House by each Conveyor.

The coal carbonized being only 33,072 tons during the year, the capital charges are higher than those given when the quantity was assumed to be 47,619 tons; the latter quantity being the amount that would be carbonized if the whole retort-house was in operation for 200 days per annum. The quantities of gas used for engines, and the oil used for coke machinery, are greater per



View on High-Level Railway—The Compressed-Air Capstan used for Driving the Full Coal Waggons and Returning the Empties.

ton of coal than those given in my paper; but the renewals and repair wages are less. The totals of maintenance charges against machinery are slightly less per ton of coal than those previously given, though the capital charges are increased owing to the smaller quantity of coal carbonized. The final total of all charges per ton of coal remains practically unaltered.

Coke and Breeze.

The following tables give comparative results relating to coke and breeze in the section of the works fitted with direct-fired retort-settings and that fitted with regenerator settings.

Per Ton of Coal Carbonized.	Direct Fired. 1902.	Regenerators. 1903.	Increase.	Decrease.
	Cwt.	Cwt.		
Coke made (say)	13·5	13·5	—	—
Coke and breeze mixture delivered into yard	9·35	11·39	2·04 cwt. = 21·82 %	—
Coke used in furnaces of settings	4·15	2·11	—	2·04 cwt. = 49·15 %
Breeze used for boilers	·74	1·15	·41 cwt.	—
Coke and breeze sold	8·61	10·24	1·63 cwt. = 18·93 %	—

The increase of coke and breeze sold amounted to more than 3000 tons for the year.

Coke Used in Furnaces of Settings.

	Direct Fired, 1902.	Regenerator, 1903.	Decrease.
Per 100 lbs. of coal carbonized	20·75 lbs.	10·55 lbs.	49·15 per cent.
,, 1 cwt. ,, ,,	23·24 ,,	11·81 ,,	

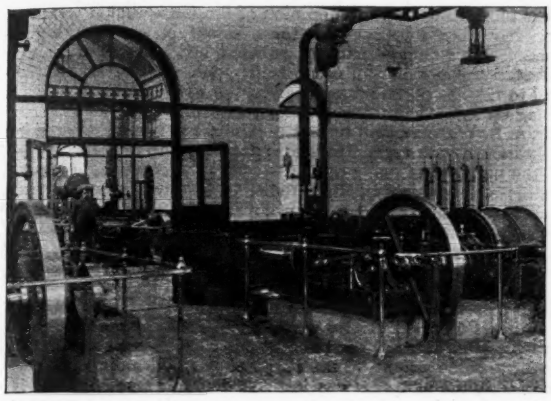
Percentage of Breeze.

—	1902.	1903.	Increase.
	Per Cent.	Per Cent.	Per Cent.
After passing breakers	15·79	17·42	1·63
Before ,, ,,	9·19	10·82	do.
Increase owing to breakers	6·6	6·6	—
Average breeze	12 49	14·12	1·63

The total increase in breeze made over the whole year owing to the use of stoking machinery and coke conveyors equals 1·63 per cent. Half the mixture of coke and breeze sent out of the retort-house passes through breakers.

Reversible Annular Condenser and Naphthalene.

In commenting upon the Carpenter type of reversible condenser, the Editor of the "Journal of Gas Lighting" expressed the hope that my chief, Mr. William Hardie, would continue to have tests made for naphthalene in the purified gas. The results given in my paper have been fully confirmed by subsequent tests; the average amount of naphthalene in the gas being 5·1 grains per 100 cubic feet. The direction of the flow of gas in the condenser is reversed daily; the alteration of valves occupying only a few



INTERIOR OF THE ENGINE HOUSES—EXHAUSTER AND AIR COMPRESSORS.

seconds. Though the condenser has been at work continuously for 18 months, no labour whatever has been employed upon it, beyond the daily reversing operation, and all passages remain quite clear from any obstruction.

NAPHTHALENE IN PURIFIED GAS.

1904 1st Quarter average of	9	tests	=	4·3	grains per 100 cub. ft. of gas.					
1903 2nd	,,	,,	,,	17	,,	=	5·6	,,	,,	,,	,,	,,
,, 3rd	,,	,,	,,	12	,,	=	4·3	,,	,,	,,	,,	,,
,, 4th	,,	,,	,,	11	,,	=	6 2	,,	,,	,,	,,	,,

The average of these 49 tests = 5·1 grains per 100 cub. ft. of gas.

The largest quantity of naphthalene was 9·5 grains, and the smallest quantity 2 grains, per 100 cubic feet of gas.

WORK DONE BY SCRUBBERS.

In a commentative article which appeared in the "Gas World" upon my paper of last October, the statement was made that certain particulars relating to the work done by the Carpenter type of scrubbers would be of value. The following may be considered the ordinary working results when 7½ oz., 10 oz., or 16 oz. liquor is being made. The wetted surface was 47 square feet per 1000 cubic feet of gas, when a million cubic feet of gas per day was dealt with. The scrubbers have, however, extracted all the ammonia when a larger quantity of gas has been passed through, and the wetted surface reduced to 28 square feet per 1000 cubic feet of gas per day. The total quantity of liquor pumped through the scrubbers amounted to 260 gallons per ton of coal carbonized, or about 25 gallons per 1000 cubic feet of gas.

GAS ENTERING SCRUBBERS.

Approximate No. of Grains per 100 cb. ft.	Ammonia.	Carbonic Acid.	Sulphuretted Hydrogen.
	180 — 220	1100 to 1200	600 to 700

Strength of Liquor.	Ammonia		Carbonic Acid		Sulphuretted Hydrogen		Water.	
	from Gas.	in Liquor.	from Gas.	in Liquor.	from Gas.	in Liquor.	Gallons used per 100 Cb. Ft. of Gas.	Gallons used per Ton of Coal.
Oz.	Grains per 100 Cb. Ft.	Per Cent.	Grains per 100 Cb. Ft.	Per Cent.	Grains per 100 Cb. Ft.	Per Cent.		
	Average.							
7·5	200	1·59	228	1·82	71	0·57	0·176	18·6
10·0	,,	2·11	232	2·45	49	0·52	0·132	14·0
16·0	,,	3·33	241	4·02	30	0·51	0·082	8·73

PURIFICATION.

The cost of purification has only been slightly reduced; the cost during the year being ·61d. per 1000 cubic feet of gas. The arrangements to facilitate the delivery of the purifying material to the new works not having been completed, and certain other adverse conditions of working, have prevented a greater reduction of purification costs been made. During the period when the carbonizing plant was working at full capacity, the respective gas passage areas in the old and new works were 0·38 square feet and 0·54 square feet per 1000 cubic feet of gas passed per day; and the respective grid areas were 4·96 square feet and 9·75 square feet per 1000 cubic feet. The differences of these areas were much less during a considerable portion of the year, owing to the fact that the old works were doing full duty for one month, whereas the new works were working at full capacity for about five months of the year. A reduction of 10 per cent. in the cost of purification will balance the interest on the capital expended to provide the enlarged purifying area and house accommodation.

GENERAL FINANCIAL RESULTS.

The profit entirely due to the improved plant and methods of working—after maintenance charges against machinery have been deducted—is sufficient to pay interest at the rate of 27·7 per cent. upon the cost of machinery and upon the extra cost of the portions of plant which have permitted the increased profit to be earned. In other words, if this profit had not to be utilized in the reduction of the price of gas, then the special capital outlay just referred to could be liquidated in about four years.

Discussion.

The PRESIDENT thought they were all very much indebted to Mr. Hovey for the supplementary paper he had read, and which formed a very admirable completion to his communication last October. It practically covered twelve months' working, which enabled them to judge of the excellent results that they had obtained at Tynemouth. He was sure no one would be better pleased than Mr. Hovey if there was a good discussion on the paper, as, after the trouble he had been put to, they could not pay him a greater compliment.

Mr. W. DOIG GIBB (Newcastle) said that it was with a certain amount of regret that he had heard Mr. Hovey read the supplement. He understood that it was to be a summary of his former paper; and his feeling in the matter was that his former paper was so full of debateable matter that they could have usefully employed all the time at their disposal in discussing it, and have the prospect, in the near future, of getting a separate paper from Mr. Hovey (and having a separate discussion upon it) on the working of the plant. The combination of the two papers really opened such a field for discussion that it was difficult to know where to start, and would be equally difficult, he was afraid, to know where to finish. But it was his pleasure, at the Darlington meeting, to move a vote of thanks to Mr. Hovey; and while doing so, he expressed himself as convinced that the praise and appreciation which he gave of the paper would be justified when a more careful survey of it could be taken, and the results studied. He was sure everyone agreed that this was the case. He did not propose to criticize any of the figures, or compare them with his own workings. The paper gave such a mass of figures as would help to lighten the labours of all gas engineers for many years to come. But it was rather surprising, and at the same time gratifying, to find that events in the gas world were moving so quickly that what was, in Mr. Hardie's case, and only a year or two past, the best practice in the retort-house for the arrangement of coal-stores, the charging and stoking machinery, and the handling of coal, would probably have to be carefully considered by a designer of to-day. There were so many machines in the market that their merits would have to be carefully considered. There was the De Brouwer machine, the Settle-Padfield process, the handling of coal by iron waggons with endless ropes, as against coal-conveyors, and various matters of this sort. Mr. Hardie, he observed, had put in a coke-breaker. This was not a new introduction altogether in the North, because Mr. Hardie was one of the first to do so; and his experience with it, though it was on a small scale, had resulted in a larger sale of coke. Following his example, the Newcastle and Gateshead Gas Company erected one at their Elswick works; and this machine, though it had only been down for three or four years, was already too small for the demand for broken coke. Mr. Hardie had adopted Mr. Carpenter's form of reversible condensers; and it was very interesting indeed to learn from the figures Mr. Hovey had given them, that the anticipations that this form of machine would, to some extent, tackle the terrible naphthalene trouble, had been justified. Lately, when he was at the South Metropolitan works, he noticed that Mr. Carpenter was still experimenting with the condensers; and they hoped that not only would Mr. Hardie give his experience with the condensers, but that Mr. Carpenter would see his way to present a paper which would show that he had, in some way, improved upon the original form. Mr. Hardie had adopted wrought-iron plates for his scrubbers. He (Mr. Gibb) was interested in this, and asked him how they worked. It seemed to him that the smooth surface of wrought iron would not hold so well as wood, with the surfaces off the saw. The surface of wood, when in that condition, had a certain spongy action; and he should have thought that not only would it hold the water better, but that greater friction would be set up between the gas and the wood than would be the case between the gas and the iron. They would also be interested to learn how the wrought-iron plates stood. It was supposed it would be risky to introduce plates of wrought iron or brass into any vessels which would be liable to be acted upon by ammoniacal liquor. Mr. Hovey's tables would save a lot of preliminary labour to others, as to the cost of new works; and to show them that these figures could be relied upon, he took out the costs of his own last extension at Redheugh. The total costs in his case came to about £31,500; and when he said that there was only a difference of somewhere about £133 between the Tynemouth and Redheugh works, it should make them more willing to accept Mr. Hovey's figures as standard ones for the district. But the statement in the paper which caused the greatest surprise was the table relating to stopped pipes. He could only attribute this to the fact that the plant was new, and express the belief that their troubles were to come. There was no doubt the general experience with machinery was that the percentage of stopped pipes was increased, and breeze was likewise increased, by the introduction of machinery. In this case, the quantity was certainly small; and if they could keep it down to an increase of 1·63 per cent., he should say they were doing very good work—or

they must have been doing exceedingly bad work before, because the difference was not only enormous, but was greater than the one which was put down in the paper. These remarks were somewhat uninteresting; but they might serve as an introduction to the discussion of a paper which was bristling with points to be dealt with.

Mr. C. Dru Drury (Sunderland) said it was with great diffidence that he rose to take part in the discussion, for it was not given to every member of the Association to design and carry out what were practically new gas-works (gasholders excluded) on such a large scale. If any hypercritically disposed person had come to this meeting, or to the meeting at Darlington, he might, perhaps, be allowed to alter the couplet, and to say that "those who came to curse remained to praise." Really, that was what he felt in the matter. All those who, like himself, had had the privilege of seeing the works, and seeing them at work, thought there was nothing but congratulations to offer to Mr. Hardie and to Mr. Hovey, on the most successful achievement that they had gained. The noble proportions of the retort-house struck one at first; and he thought it was a matter of congratulation that a certain amount of ornamentation had been attempted here, seeing that the works were contiguous to a public park and a roadway. Among the people generally there was a great amount of prejudice against gas-works; and if a certain amount of ornamentation were selected for appropriate points, it might tend to the removal of this prejudice. Of course, if they were hidden away in slums, they would not require to do this. To stand in a spacious retort-house like this, with its vast room and airiness, was a pleasure; to see the machinery working, without noise or hurry, and realize the amount of elbow-room, was a great delight. He was intimately acquainted with gas-works where the passage between the machinery and the front wall was just sufficient to enable a person to squeeze through; and the result was that one's clothes sometimes had a close connection with certain lubricants which, though they might be useful in some quarters, were certainly not useful as an article of toilet. Coming to the question of costs, the savings by machinery were remarkable; and, again, he could only offer his congratulations. Hand labour amounted to 3s. 10d. per ton of coal. This was a very good result. No doubt it included everything, which was a great matter. If it were possible, he should like to know how much of the net profit of 1s. 2¾d. was due to the coal-stoking machinery, and how much to the coke-breaking machinery. He must certainly congratulate Mr. Hovey on the absence of stopped pipes. Like Mr. Gibb, he could not help being surprised at such a complete absence; but he had been to the works several times, and he had never seen a stopped pipe. He could not say that he had no stopped pipes in his works. Ever since the introduction of machinery, there had been a fair amount of them—not so bad as many people in like circumstances had, but until the introduction of machinery they were almost unknown. He put down his immunity from stoppages to the use of comparatively small retorts, with the result that the charges almost completely filled them. The figures given as to the results of the reversing of the annular condensers were most highly satisfactory. If everyone could reduce the naphthalene in the gas made from Durham coal to an average of 5 grains per 100 cubic feet, he was sure he would get to the bottom of a lot of his troubles. Only the other day he was seeing the results of washing with hot tar in the condensers; and there the amount of naphthalene was reduced to 4 grains. It was most successful. Apparently they were now on the right track; to a certain extent they seemed to have several strings to their bow in the matter of getting rid of this bugbear. He should like to know how much naphthalene there was in this gas, and whether, when the first reversal of the condensers was made, the naphthalene was very much more limited than it was (say) 23 hours afterwards. Would the tests made (say) twelve hours after the condensers were reversed show a fall; or at what time—say just after the reversion—was the naphthalene very much more limited than when it was reversed again? He would also like to know whether any effect had been noticed in the district as to the naphthalene troubles—whether they had been reduced materially? The Carpenter type of scrubber seemed to be doing very good work, and the capital charges seemed to be low. As compared with his scrubbers they were very cheap; but what struck him was that if the unit system—he understood it was a unit system—was expected to be successful with the scrubbers, why not extend it to the purifiers, as Mr. Carpenter suggested in his paper some years ago? It seemed to him that the same necessity arose for the unit system in the purifiers as in the scrubbers. His own experience was that, with lime purification, they made the purifiers too large. These satisfactory financial results constituted these works the envy and admiration of everyone.

Mr. G. S. Sayner (Harrogate) said that if he were in order, seeing that he had only just been again elected to membership, he would like to make a few remarks, and to ask one or two questions, with reference to the excellent and valuable paper for which the meeting was greatly indebted to Mr. Hovey. The first thing was that he noticed, in reading the paper, that the coal carbonized amounted to 3 cwt. per retort, with a make of 6500 cubic feet of gas per mouthpiece per day. What was the particular reason it was limited to this? Or what was to hinder the charges being larger? Was it due to the machinery? With regard to the charges against machinery, as in the table, including interest, he was inclined to share the opinion of Mr. Gibb, that, if wear and tear were taken into account, these would be considerably increased. He would like to ask to what Mr. Hovey particularly attributed the prevention of stopped pipes. Was it to be attributed to the use of machinery? or to the prevention of cold air rushing up from the furnace floor, by the coke-conveyors?

Mr. A. B. Walker said he had to join in the general expression of admiration with regard to the paper, and also the works. He had the pleasure of going over the works the other day with Mr. Hardie; and he might mention that the absence of stopped pipes, which had been touched upon by all who had spoken, was a matter which also struck him. He attributed it largely to the respectable size of the auger which Mr. Hardie used. Mr. Hardie was good enough to take him up to the top of the bench, when the hydraulic main was in process of being cleared out; and he was absolutely surprised to find that there was not more than ½-inch of thick tar in it. Possibly this also partly accounted for the absence of stopped pipes. He did not know whether Mr. Hardie would attribute it, to some extent, to the shape of the hydraulic main; but he certainly thought this was in some degree responsible for the absence of thick tar in it. It was well adjusted. As regarded the question of wages, it was, perhaps, well not to say a great deal by way of comparison of wages in the various works in the district, because they all knew how tightly they were tied by members of Trade Unions; but Mr. Hardie could fairly go before the Trade Unions and demand some reduction of his wages, because in many places they could show that they were doing their work much cheaper. Mr. Drury raised the question of the naphthalene in the condensers under the Carpenter arrangement; and it had struck him that Mr. Hovey might be able to give them, as well as the temperature at the inlet of the small condenser, the temperature at the inlet of the outside condenser. He himself took particular notice of the temperature in that part of the plant; and the reduction from one end of the condenser to the other was certainly very gradual. On the whole, it was very small for the amount of travel of the gas; and probably the amount of naphthalene found at the entrance to the Carpenter condenser would certainly not be so large. He would also like Mr. Hovey to say whether he noted the temperature of the gas at the various places where he took his tests for naphthalene. He gave them the maximum of 9·5 grains per 100 cubic feet, and the minimum of 2 grains. He would be pleased if Mr. Hovey would give them an explanation with regard to the difference in the conditions under which these two determinations were arrived at. In his supplementary paper, Mr. Hovey reckoned that one machine would work 24 ovens of retorts. He believed it was the claim of Mr. West that his machine could work one retort per minute. He thought he would scarcely be able to do it. As regarded the question of coke, he had had no experience himself with machinery either for conveying the hot coke or for breaking it; but certainly it seemed to him that 10·24 cwt. of coke per ton of coal—being solid coke and breeze included—was not excessive for the type of regenerator that Mr. Hardie had introduced. No doubt by the time Mr. Hardie got his furnace men and stokers educated up to the saving of coke, he would be able to do from ¼ cwt. to 1 cwt. better than this. With regard to the question of the scrubbers, the same point struck him as it apparently did Mr. Gibb, as to how long the iron plates in the scrubbers would stand. Probably Mr. Hovey would be able to give them some information as regarded pitting or otherwise. Referring to the last table in the supplement—gas entering scrubbers—did he understand from Mr. Hovey, under the head of sulphuretted hydrogen, that the 16-oz. liquor took up only 30 grains, and that the 7·5-oz. liquor took up 71 grains? Or was this the amount of sulphuretted hydrogen which went forward to the purifiers? It seemed to him that if by working the liquor up to this extent they could get a difference of nearly 100 per cent., it would pay them to work the liquor up to this strength. One of the chief features of the works was the purifiers and the general arrangement of the whole buildings; and when he looked round about some other works, where, perhaps, they were very tight for space, he could not help thinking that the saving which had been made in the structure would go a long way to make up the cost of putting up another new set of purifiers.

Mr. T. Hardie (Gateshead) did not propose to criticize the paper; but he could not allow it to pass without just rising to congratulate Mr. Hovey. It was really one of the best papers they had had before the Association; and it had been of great interest to him. The results which had been obtained at Tynemouth would, he thought, equal those in any gas-works in the country. Mr. Walker had referred to the working costs in a manner which had surprised him very much. It was only very recently that a paper was read before another Association, at Manchester, in which the working costs given by machinery compared, he thought, very much to the advantage of Tynemouth, where, for a works of their size, the working costs were very low indeed. With respect to stopped pipes, one could only be astonished that it should be as was stated. They were very much troubled with them, curiously enough. It might have something to do with the size of the retort, because, working with retorts 21 in. by 15 in. in one house, he found practically no stopped pipes. In a house where they had retorts 22 in. by 15 in., they had more stopped pipes; and in one where they had 22 in. by 16 in. retorts, he found that they had a tremendous number of stopped pipes. This might, to some extent, explain the matter

but, strangely enough, at Tynemouth, he believed that the size of retort was 22 in. by 16 in. Therefore this was apparently not the sole reason. There must be some other reason; and no doubt it largely depended upon the working of the hydraulic mains, and to some extent upon the heat in the retorts. At North Shields, it had been brought to his mind that, in the paper, the make of gas was given as 6500 cubic feet per mouthpiece per day. Now this, with machinery, was not what could be called a large make; and it meant that the heat in the retorts had not been excessive. When they got above 7000 cubic feet per mouthpiece—say, 7500 cubic feet—then was the time when they began to feel the stopped pipes; and it was a question whether it paid to work at such high heats, on account of the extra expense they had to go to in cleaning out hydraulic mains and ascension-pipes. At Tynemouth, they were also to be congratulated on the very small quantity of breeze they made with their machinery. Coke-conveyors had got a very bad name for the making of breeze; and he himself thought rather badly of them in this respect. But coke-conveyors were perhaps blamed rather more than they ought to be. Many people working conveyors expected the coke to travel, first in one direction and then in another, to tip it here and tip it there, to screen it and put it through several different processes, and then to get no more breeze than they did with ordinary hand working. Now, of course, it was not the fact that, in such a case, the coke-conveyor made the breeze, but that the coke passed through so many different processes. At Tynemouth, the coke-conveyor had a straight run from one end to the other. The coke did not fall off one part of the apparatus on to another; and there was no friction whatever in working it. When working with the De Brouwer conveyor, this was as it should be. The capital costs for the whole plant were exceedingly low, for the very ample and magnificent buildings which had been put up; and he could only congratulate the Tynemouth people on their designs.

Mr. W. Hardie (Tynemouth) said that perhaps he might be allowed to make one or two remarks. He did not wish to reply in any way which would interfere or take anything from what Mr. Hovey would say; but there was just one item with regard to the question of naphthalene he would like to say a single word about. One of the speakers asked, in reference to the testing of the naphthalene, if it were taken at different times during the twenty-four hours. He might say no test had been carried out in this way, because the naphthalene test, like the sulphur test, took about twenty-four hours to carry out; and therefore they got practically the average for the twenty-four hours. Another point was that they had not carried out the tests at the various portions of the plant, but they found, in their old works, that they reduced the naphthalene, by taking it out with a special creosote oil, from about 18 grains per 100 cubic feet down to about 3 grains. He did not know if any tests had been made to see exactly what amount was taken out in the new works, but he did know that they got it down, on an average, to what Mr. Hovey had stated. As regarded stoppages in general, he might say that there had not been a very great deal of difference shown in them; but he was not surprised very much at this, because he did not expect that they should get quit of their naphthalene trouble all at once. He knew that very recently they had been working with large mains nearly half filled with naphthalene; and he supposed it would take some time before this was got out of the way. But he knew, with absolute certainty, that the gas sent into the town now contained very much less naphthalene than it did before; and they were bound to reap a benefit from this source. He was very pleased that Mr. Hovey had brought the paper before the Association; and he heartily congratulated him upon it.

Mr. Hovey, in closing the discussion, said the first matter he wished to refer to was with reference to the iron plates. The spaces between the plates were extremely small, and the quantity of liquor pumped through was considerable; and the gas got thoroughly into contact with the liquor. The spaces being so small, the gas was split up into many streams; and not only did it pass up the spaces, but the various bundles were crossed at right angles, so that a great many small spaces were formed, which the gas had to go through, and it got thoroughly disintegrated in the passages it had to encounter. As to the deterioration of the iron plates in the liquor scrubbers, at Nos. 1 and 2 it was not appreciable up to the present time—they had been working eighteen months now. But in the principal scrubber, the top row had deteriorated very slightly—the three bundles on the top. There were 72 bundles altogether, three in each row; and the top row was slightly corroded in the centre, just below the strength of the inflow. The next point had reference to stopped pipes. He attributed the non-occurrence of stopped pipes, first, to what Mr. Walker had said about the use of a larger auger at the bottom. But this only dealt with the bottom portion of the pipe, and stopped pipes, as they all knew, were not confined to the lower part; and though they were thoroughly cleaned by the large augers, higher up they found them to be also perfectly clean. In the old days, men had to go up ladders to clean them. Mr. Walker also mentioned the design of the hydraulic main. The arrangement was that the tar flowed as well towards the back as towards the outlet, and a certain quantity was run off after every charge, just to keep the outlet perfectly clean, and to allow a continuous flow of tar and liquor from the main. Thus, if a small quantity of thick tar formed, it had a good chance of being taken away, instead of lying and gradually congealing, and increasing in quantity. Therefore, to the running of the tar, and the design of the hydraulic main, as well as the use of the auger, he attributed the absence of stoppages. The quantity of tar taken out when the mains were cleaned, at the end of the summer season, was almost a formal matter, because there was practically nothing to take out; and, in looking down some of the pipes which were now laid off, after having been worked through the whole winter, they were found to be quite as clean as when they were first put up. With reference to the amount of gas produced per mouthpiece they only made a small quantity to start with, and gradually increased it. For the last three or four months, however, they had gone up to 7000 cubic feet per mouthpiece; and they had for some considerable time been making from 7300 to 7400 cubic feet. So that they might judge that the heats were fairly good. The next point was with reference to breeze from the coke-conveyor. He agreed with Mr. Thos. Hardie, that so long as the coke was conveyed in a straight line, without any breaks or stops or sharp turns, there would be practically no breeze; but when they had sharp turns in the conveying of it, with the coke falling off the side or dropping from one conveyor on to another, they would have breeze made. In their case, they were in a very favourable position for getting out the coke in a straight line and with a gradual ascent. Mr. Drury spoke about the ornamental design of the retort-house and other buildings. There had been a certain amount of money spent on this; but it was extremely small, and he thought that such work paid well for what it cost. The total amount which could have been saved on the retort-house, if it had been put up in a perfectly plain manner, was not more than about £600. Mr. Drury asked for particulars as to what the coke machinery saved and what the stoking machinery saved. These particulars were mentioned in the paper, where the net profit was given at 10·3d. for the coal-stoking machinery, and 3·9d. for the coke machinery. Mr. Drury spoke about the naphthalene at the inlet of the condenser. Before the gas reached the annular condenser, it passed through the condenser on the retort-house wall, and after this through a tar-screen box, similar to that first designed by Mr. Gibb, of Newcastle. Upon entering the condenser, the gas contained about 20 grains of naphthalene. The outlet figures had been given; but the figures with reference to the number of grains of naphthalene were not before entering the purifiers, but after passing through the meters. The cost of purification had not been greatly reduced, and the amount of sulphuretted hydrogen extracted had not been very large, especially with the higher quality of liquor. The coal carbonized was given in the paper at 3·1 cwt. per mouthpiece; but, as he said, they had greatly enlarged upon this. The reason why the smaller quantity was mentioned was so as not to give figures which could not be quite easily obtained by anyone. Mr. Sayner spoke about cold air going up from the furnace floor as tending to prevent stopped pipes. This was a very good point; and if it were not for the fact that on one side of the retort-bench the cold air was allowed to go up, and that on the other side the furnaces came out on to the stage floor, and no cold air was allowed to get up, he should imagine that Mr. Sayner had struck one matter which would tend to prevent stopped pipes. But when, on one side, the cold air was allowed to get up, and, on the other side, it was not, and there was no difference in regard to the stopped pipes on either side—there being none at all—this could not be a reason. Mr. Walker had spoken about the wages being high. He did not say whether this referred to the old or the new works; but the presumption was that he meant the new section. The quantity of coal carbonized during the past year was comparatively small; and if they were able to work the twelve settings constantly, and had not to change to a smaller numbers of settings, they should be able to reduce the cost of carbonizing by not less than 5d. per ton—that was 5d. per ton improvement on the figures already given. Mr. Walker thought that the quantity of coke used in the furnaces was rather high. Perhaps it was; but they had not yet reached their ideal. They had made an improvement, and intended to do more in this direction yet; and this was one point which they would bear in mind. Mr. Walker spoke about the purifier-house as being a commendable feature of the works; and it was indeed one of the cheapest portions, the whole house costing comparatively little—in fact, very little, considering the area which it covered. He thought he had touched upon most of the points mentioned, the principal of which had been in connection with the stopped pipes and the cost of the coal carbonized.

MR. JACQUES ABADY ON "PHOTOMETRY."

Mr. Jacques Abady delivered the following lecture on

PHOTOMETRY IN RELATION TO GAS TESTING.

The subject I have chosen for my lecture—"Photometry in Relation to Gas Testing"—is one that I know is of vital interest to you all; and the present mixed condition of affairs in regard to photometry calls for a speedy solution. I should have liked, therefore, as this is the main topic of my address, to have commenced in the middle, by saying that photometry itself is a science, while gas testing is not; but I want to just trouble you for a little, by taking you through a few elementary facts with regard to photometry itself, so as to show you the connection

between photometry as a science on the one hand, and practical working on the other.

I take a piece of metallic selenium, pass an electric current through it, and place it at a known distance in the path of the rays of a standard of light. I notice the deflection of the galvanometer. I next expose it to the rays of another light, and again note the deflection of the galvanometer. I move the light until the deflection is the same as for the standard light; and I have two sources giving equal lights but at different distances. That, gentlemen, is a photometer—one of a large class which affords comparisons useful in photography and the like, but which are independent of the observer, do not measure the physiological effect of light upon the eye, and therefore are of no practical interest in commercial light testing.

The selenium test of Siemens and Halske is based on the fact, discovered by Sale, that the electrical resistance of metallic selenium diminishes under the influence of light. Other interesting examples of the same class are Dessendier's photometer, based on the action of light in forming hydrochloric acid from hydrogen and chlorine; and Lion's photometer, based on the assumption that iodide of nitrogen is decomposed by light—the quantity of nitrogen liberated varying with the intensity of light. A final and recent example is the attempted substitution of the bolometer for the eye, an interesting account of which will be found in the "Proceedings of the American Institute of Electrical Engineers," for, I think, 1896.

I have mentioned these "light-action" or chemical photometers, because I want, by contrast, to show more distinctly what is the essence of the class of photometers we are all familiar with. Of course, it will be obvious to you; and when I say I am now looking at about two hundred photometers, you will know I mean I am looking at about a hundred pairs of eyes.

The eye, then, is the standard piece of photometric apparatus—the sound, normal, healthy eye; and upon its soundness depends the sensitiveness of the photometric operation. But though the eye may be the photometer, it is light we want to measure; and therefore you will pardon a consideration of a few elementary facts with regard to light. What is it? When we measure it, what do we measure, and what laws govern its measurement?

Light, so far as we know, consists of ether waves, transversely vibrating and with varying frequency, which, falling upon the retina, create the sensation of sight. The greater the frequency, the shorter the waves, and the more actinic the light. It may proceed directly from a light source, be a specular reflection as from a mirror, or a diffused reflection as from (say) a white tablecloth. Various substances have varying reflective or diffusive powers; the complement of the diffusing power being, of course, the absorbing power. Thus black velvet absorbs about 99 per cent., and diffuses 1 per cent.; a white tablecloth diffuses perhaps 80 per cent., and only absorbs 20 per cent. You will have noticed this in your own dining room (particularly with a centre light). When the cloth is removed, there is a distinct loss of illuminating effect in the room.

I have stated that the colour of light varies with the frequency of the vibrations. This question of colour appeals to another sense—namely, our "colour-sense." Its effect and influence on photometry, I shall mention in a moment.

Now when we measure light, we do not measure the actual intensity of a source of light, or the intensity of illumination of a surface, but the effect on the eye and the optic nerve; and, consequently, we only measure those radiations which are perceptible to the eye.

Digressing a moment, it may be observed that the pupil dilates or contracts as the light observed is weaker or stronger. This fact has been taken advantage of by Gorham, Lambert, and others, who have endeavoured, by accurately and rapidly measuring the extent of dilation or contraction, to construct a ratio between the diameter of the pupil and the intensity of the light. This is called a "pupillary photometer," and is only of academic interest to us.

Now if, as I have said, the eye is the standard piece of photometric apparatus, what do we want the apparatus we call a photometer for? The answer is that, although the eye, and the eye only, appreciates with precision when one light is equal to another, yet it cannot measure relative quantities; and a photometer is therefore necessary to determine the ratio of two illuminations, by enabling us to vary the two sources and express one in terms of the other.

We come, then, to the rules governing light measurement. They are very simple—can be proved by equation up to the hilt—and so I will merely mention them.

The first law is "Kepler's Law of Inverse Squares," which is that "the quantity of light falling on a given surface varies inversely as the square of the distance from the source." Thus given two lights, x and y at distances a and b respectively from the comparison screen—their ratio is that $x : y :: b^2 : a^2$.

The second law is "Lambert's Cosine Law," which, however, has recently been shown to be but approximately true, and is that "the intensity of illumination which is received obliquely, is proportional to the cosine of the angle which the luminous rays make with the normal to the illuminated surface."

The third law is the "Generalized Photometrical Law," which is that $e = \frac{I \cos \theta}{d^2}$ where e is the light falling on a given surface, I the intensity of the source, θ the angle of incidence of luminous ray, and d the distance of the source from the screen.

Now with these three rules, we can make clear the whole theory of light measurement.

Take this piece of white cardboard, and assume that on one side at 1 foot away, there is a 1-candle pentane standard, which balances at 10 feet on the other side a light we want to measure. The power of the light is $\frac{10^2}{1^2} = 100$ candles. That is the power of the light itself—not the quantity of light falling upon the screen.

This latter is shown by our third equation, $e = \frac{I \cos \theta}{d^2}$. Suppose the screen is at right angles to the path of the rays of light, and take the above figure:

Then $I = 100$, $\cos \theta = \cos 90^\circ = 0$ and $d^2 = 100$ feet

$$\therefore e = \frac{100}{100} = 1 \text{ foot candle.}$$

But assume the light was moved so as to fall on the screen at 45°, but be the same distance—viz., 10 feet:

Here $I = 100$, $\cos \theta$ is now $\cos 45^\circ = \frac{1}{\sqrt{2}} = 0{\cdot}7071$ and $d^2 = 100$ feet

$$\therefore = \frac{100}{100} \times 0{\cdot}7071 = 0{\cdot}7071 \text{ foot candle.}$$

The appreciation of this generalized photometrical law enables us with ease to gauge the limits of a possible photometric test. I do not think an ordinary photometrist is capable of comparing lights of less than half-a-foot candle on the usual comparison screen or disc.

You will see what error is induced if the cosine law is introduced without correction; and seeing that it has been found to vary with different surfaces, it is better to avoid it in photometry by the simple device of equalizing the angles at which the rays of the standard of light and the compared light fall upon the disc, because then cos θ on each side is equal, and can therefore be eliminated, leaving only the ratios of the inverse squares. Thus in the example given above, if the disc were turned so as to present an angle of $22\frac{1}{2}^\circ$ to either light, instead of 90° to one and 45° to another, then cos θ would be on either side cos $22\frac{1}{2}^\circ$, and being equal, could be eliminated. This is a simple enough process to grasp, yet only recently some London street tests were given wide publicity, in which this simple fact was totally disregarded.

Now to come back to our photometers. Those in which the functions of the eye are brought into play, may be conveniently divided into five classes, and rapidly reviewed in passing.

The first class comprises spectro photometers, which measure different portions of the spectra in addition to, or in place of, measuring the total intensity of light sources.

The second class are those based on visual acuteness. All the flicker photometers, the heterochromatic photometers, belong to this class; and in this field may be included the work of Crova, Weber, Tresca, Macé de Lépinay, and many others.

The Weber photometer uses the Lummer-Brodhun principle, and is based upon the action of various diffusion screens, whose co-efficients have been previously ascertained. With care in standardizing, it can be used under certain circumstances with advantage. The use, however, of various parts all requiring standardization, is not a feature that appeals to one; it introduces complications likely to cause, in the aggregate, errors of considerable dimensions. About the flicker photometer, you have heard *ad nauseam*. I will just say that the Simmance-Abady "Flicker" is purely the practical application of the alternate vision theory, first known as the Newtonian, and attempted many times; and it can be applied with perfect accuracy to heterochromatic as well as to ordinary photometry. It sorts out the colour sense from the light sense, and may be destined to take the place of many photometers much more ingenious in conception, but impracticable for commercial use.

The third class of photometers comprises those based on the properties of polarized light. These polarization and compensation photometers are exceedingly interesting, and very ingenious; and had my object been to give a history of photometers, I should have liked to refer to the work of Duboscq, Wild, Wybauw, Grosse, and others.

The fourth class—dispersion and diaphragmation photometers—only require mention.

The fifth class comprises those photometers in which the fundamental photometric laws are applied—by varying the distance or inclination of the surfaces whose illuminations are to be made equal. In this class lie most of the practical photometers; and a brief description of a few may be useful.

Let me say at once that I only know of two in which the cosine law is used—the Arnoux photometer, and Trotter's, neither of which is, I think, now made. All the remainder use Kepler's law, as you will see.

One of the earliest photometers was that of Bouguer, who used a transparent screen, placed the two lights behind it, with a partition at right angles to the screen, and then moved back one of the lights until the two portions of the screen appeared equally illuminated. Kepler's law then applied. Foucault improved this arrangement by moving the dividing partition by means of a screwed rod until both illuminated surfaces were brought side by side, thus rendering the comparison easier.

Lambert used a similar screen (wrongly ascribed to Rumford) with the well-known shadow device; and, for some reason or other, it is this apparatus that the ordinary reader of popular science books has in mind when he speaks of a photometer. By the way, what a wonderful genius Lambert had—his work, which appears fresh and almost up to date, was done almost one-hundred-and-fifty years ago!

Harcourt adopted a modified arrangement of the Foucault and Lambert photometers, and the arrangement now widely known as the Harcourt table photometer is thus, though elaborated and specialized, but a "reversion to primitive type."

The Dumas-Regnault photometer, the French official instrument, is purely and simply a Foucault photometer; and I can speak from personal experience as to the excellence of this simple arrangement when similarly coloured lights are compared.

The Ritchie wedge, you all know. It was one of the first which could be conveniently placed on a divided bar in a line with both lights. It is not used now to any extent.

The Thompson-Starling wedge is a modified arrangement of this, but one light receiving surface is above the other.

The Elster screen, the Joly paraffin prism, are examples of diffusion screens of historical interest only.

The Bunsen screen or disc need not be described. You are all painfully familiar with this excellent instrument. It stands alone in its simplicity, convenience, and perfection; and when lights of the same colour are compared, it is absolutely sound. The Bunsen disc box, as you know it, consists of the Bunsen screen with grease spot, the Rudorff mirrors making an angle of about 140° with each other, and the reversible disc-holder, ascribed—correctly, I believe—to Dibdin.

I have taken from the report of the Netherlands Gas Commission the following comparison of the percentage of accuracy of various screens; the figures being the percentage departure of average readings from a true mean value:—

(1)	Bunsen screen.	± 0·08 per cent.
(2)	Foucault screen	± 0·32 ,,
(3)	Lummer-Brodhun screen . . .	± 0·52 ,,

The Foucault screen covers all that type where the lights are thrown side by side and viewed on a screen—like the Harcourt, for instance. The results are, I think, a triumph for simplicity.

There is what I think is a rather funny incident in connection with the Bunsen screen, which you see from the foregoing figures, in its ordinary form with mirrors, is almost perfect. As you know, the reflection of the two surfaces does not come side by side, so Herr von Hefner-Alteneck, to bring the fields together, placed a prism in the eye-piece. This, it was found, caused a deformation of the images produced by reflection and refraction, and one would have thought it would have been taken away again. Not so. Another inventor, Krüss, added other prisms to correct the errors in the first; and so, in the place of our beautifully simple apparatus, we have a nice scientific looking optical arrangement.

Mentioning optical arrangements, reminds me of the Lummer-Brodhun screen, which is a somewhat complicated optical train for obtaining the same effect that Alteneck attempted to get with the Bunsen screen, and throwing the images (but reflected from a diffusion screen) side by side. From a long experience with it, I am bound to say that I fail to find the slightest advantage in its use, or justification for its adoption. Moreover, I suspect that it is open to objection on account of the use of the diffusing screen, and its consequent liability to deviation from accuracy through the recently discovered error in Lambert's law. It is admittedly no use for colour work; and the figures of the Netherlands Commission cited above, show that it is not as accurate nor as sensitive as the Bunsen disc for ordinary work.

It may be that I am prejudiced because this is an idea evolved in Germany. I do not think I am, though I protest against the unreasonable leaning which our professors in all branches of science have towards anything German, simply because (I cannot help thinking) it is German. This attitude seems to me to be on all-fours with the popular view of singers. Mr. Jones has only to call himself Signor Giovanni, and his throaty notes are hailed with rapturous applause.

How many people know, I wonder, that there exists in this country an Institution—the National Physical Laboratory—which in the capacity of its officers for scientific research, compares favourably with the much vaunted, and justly praised, Charlottenburg Institute; indeed, I am tempted to say, as a Britisher, it goes one better. It is time we appreciated, and made use of, our own facilities of this nature, and learned that England is still worthy of being the country which produced a Newton and a Davy.

Before I come to the subject of gas-testing photometers, I should like to recur again to colour sense, and to explain why the comparison of lights of different colours cannot be undertaken in the manner usual for lights of the same colour. The reason is because of the existence of the phenomenon known as the Purkinje effect, which is that when two surfaces illuminated by lights of equal intensity but of different colour—as red and blue—are viewed side by side, one appears relatively brighter than the other according to varying conditions under which the screen is viewed. Further, if (say) a Bunsen disc is used with lights of various colours, its function vanishes, because the grease spot—the disappearance of which is the signal of equality of intensity—will not disappear under these circumstances.

The alternate vision or flicker photometers get over the above difficulties by sorting out, so to speak, the colour sense, and enabling one to judge of intensity quite apart from colour differences.

The final class of modifications in photometers I have to refer to, is that of their application to different purposes. So many are these different uses that I propose putting all on one side save one—viz., gas-testing, in which you are all interested, though there are many points of interest in connection with testing of lights as distinguished from the quality of gas which perhaps I shall be privileged to discuss on another occasion. Indeed, the conditions of domestic and public lighting—especially in view of increasing competition with electric light—have so much altered of recent years, that our ideas, preconceived notions, and methods of investigating this subject require thorough revision. However, that is another story.

Now to come back to gas-testing photometry. When we investigate the question of testing the quality of gas, we are confronted with many difficulties apart from the photometer itself and its accurate setting and use; and the important thing becomes no longer the photometer itself, but the method of testing.

Now, what are the different methods? Consider first the photometers. They are—

(1) Letheby-Bunsen photometer, fixed lights, moving disc-box.
(2) Evans enclosed photometer, fixed lights, moving disc-box.
(3) Harcourt table photometer, fixed standard, fixed disc, varying light to be tested.

The standards of light are of two classes—

(1) Candles (not constant, but requiring correction for consumption).
(2) Various pentane standards, typified by the Harcourt ten-candle lamp.

Let us assume, for the sake of simplicity, that, given other equal conditions, these various methods would yield the same result. I am assuming, that is to say, that candles do not vary;

TABLE A.

Showing Different Methods of Testing Gas for Candle Power.

Method.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.	No. 9.
Standard quality in terms of 5 feet of gas per hour	Candles. 16	Candles. 16	Candles. 14	Candles. 14	Candles. 14	Candles. 14 and 15	Candles. any	Candles. any	Candles. 14
Burner prescribed for use (dimensions of chimneys are all outside measurements)	24-hole "London" argand, with 6 in. by 2 in. chimney.	24-hole "London" argand, with 6 in. by 2 in. chimney.	24-hole "London" argand, with 6 in. by 1¾ in. chimney.	24-hole "London" argand, with 6 in. by 1¾ in. chimney.	"Wandsworth" burner (tri-current argand with centre peg) 7 in. by 1¾ in. or 6 in. by 1¾ in. chimney.	15-hole Letheby burner, 7 in. chimney.	24-hole "London" argand, with 6 in. by 2 in. chimney.	24-hole "London" argand, with 6 in. by 2 in. chimney.	24-hole "London" argand, with 6 in. by 2 in. chimney.
Method of consuming the gas in prescribed burner	Rate adjusted to 5 feet per hour (Gas-Works' Clauses Act, 1871).	Burner fixed for 16-candle flame value. Quality is inversely proportional to gas used.	Burner fixed for 16-candle flame value. Quality is inversely proportional to gas used.	Burner fixed for 14-candle flame value. Quality is inversely proportional to gas used.	Rate adjusted to 5 feet per hour.	Rate adjusted to 5 feet per hour.	Flame adjusted to 3 inches. Quality is inversely proportional to gas used.	Flame adjusted to fill chimney, but not to smoke or tail. Quality is inversely proportional to gas used.	May comprise any of methods 1, 2, 7, or 8.

that different standards of light all yield comparable results; that humidity, temperature, atmospheric pressure, and ventilation of our photometer room, do not affect our pentane standards, or our volume of gas, or our gas-flame; and that there is no personal error as between one observer and another. I am eliminating all differences, and assuming that the combination of these various factors of difference is a constant, whatever the photometer used, and whatever the gas to be tested.

Whence then does the unsatisfactory state of muddle in which this subject is placed at the present moment arise? The answer is a long one. It may not yield a final conclusion, but I will endeavour to give it to you; and I therefore ask your patient attention to some dry details, consideration of which the answer to my question involves.

Now, how is gas tested? The answer is, in various ways. How greatly they vary will be seen from Table A, the particulars of which are extracted from various Acts of Parliament.

As to this table, it will be seen that No. 1 method is the Gas-Works Clauses Act; Nos. 2 and 3, the Metropolitan Gas Referees; while Nos. 7 and 8 are suggested methods, but are included in No. 9, which says: "The gas is burned at such a rate as to yield the maximum light for which the burner for the time being used in making such tests shall be designed."

There are one or two other special provisions in Acts, to which I also draw your attention. One says: "The gas shall be tested with the same apparatus, and by the same method, as may be prescribed for the testing of gas of 14-candle power in the Metropolis." This is obviously, then, also included in one of the methods tabulated. In order to show how widely results differ according to the method of testing, I have made careful tests by methods Nos. 1 to 8, on five different makes of gas. The gas tested I tabulate below (Table B), calling the various makes A, B, C, D, and E.

TABLE B.

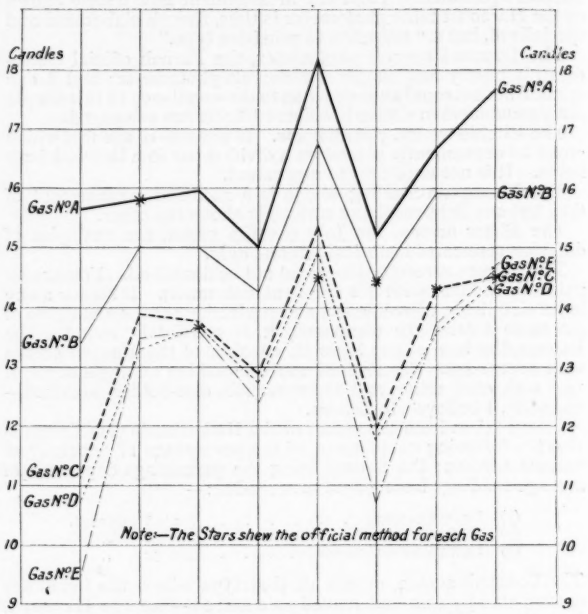
Showing Different Kinds of Gas Tested as Tabulated in Table C.

A.	*16-Candle Gas*, when tested in 24-hole "London" Argand with 6 in. by 2 in. chimney at 16-candle flame value. (Method No. 2.) This gas contains about 20 per cent. of carburetted water gas.
B.	*15-Candle Gas*, when tested in the 15-hole Letheby burner at 5-feet rate. (Method No. 6.) This gas contains about 30 per cent. of carburetted water gas.
C	*14-Candle Gas*, when tested in the 24-hole "London" Argand (any chimney) at such a rate as to yield maximum light for which burner was designed. (Method No. 9.) This gas contains no carburetted water gas, and is enriched with benzol.
D	*14-Candle Gas*, when tested in 24-hole "London" Argand, with 6 in. by 1¾ in. chimney, at 16-candle flame value. (Method No. 3.) This gas contains no carburetted water gas.
E.	*14-Candle Gas*, when tested in "Wandsworth" burner at 5-feet rate. (Method No. 5.) This gas contains about 30 per cent. of carburetted water gas.

Note.—The references to "Method No. 2" and so on are to the methods tabulated in Table A.

In making these tests, every care has been used, and every point likely to cause an inaccurate result has been looked to. Thus, the standard of light used was a ten-candle pentane standard certified by the National Physical Laboratory to be equal to ten candles. The bar was certified by the Standards Department of the Board of Trade. The meter was tested by a one-twelfth cubic foot measure, certified by the Standards Department of the Board of Trade. All calculations for rate were made by timing two complete revolutions of the meter drum. The disc-box used was the flicker, which enabled the slightest alterations to be detected on the bar. The barometer and thermometer were verified at Kew. All readings were made by two observers; and all results have been corrected for atmospheric pressure and for temperature, and all are expressed in terms of candle power per 5 cubic feet of gas per hour. In addition, careful tests of the calorific power of the gas were made. Further, the specific gravity was carefully taken and noted; and, finally, tests were made on several incandescent mantles with a "C" Welsbach burner adjusted (for air supply, &c.) to the best point, and the mean of several readings from several mantles was recorded and expressed in candles per cubic foot. The conditions of the testing rooms in each case were carefully seen to, so that the results may be taken as being free from personal error and errors of apparatus. They are set forth in Table C and shown on the diagrams exhibited, and called

TABLE D.



You will see that the diagram exhibits, in graphic form, the results shown in Table C; but I have omitted the curves for calorific power, incandescent burner, and gravity. These figures are simple enough to grasp; and I do not wish to make confusion worse confounded by giving you British thermal units per candle, or anything of that kind. The salient feature that will strike you is that there is a variation of from 3 to 5 candles in the candle power of each gas according to the way in which it is tested. So I ask you a question. What is the candle power of each of these gases? If you had a jet photometer, how would you set it in relation to either of these gases?

The answer to the second question is that, with three of the five gases cited, a jet photometer could not be used, on account of the water gas, and in the other two—well, I give it up.

The answer to the first question depends on the point of view, and there are several. If you asked a local authority (and there are local authorities not very far from London to whom the scalp of a gas company is more precious than it would be to a Sioux chief), the reply would be, "Why, the lowest result in each case." I think we can reject that reply as being partial and silly. If you asked a gas manager, I think it not impossible that he would say, "Why, the highest result in each case." I am not sure that this reply would not be just as partial, though with some slight element of reason. If you asked a consumer, he would say he was sure he did not know, but he knew his meter registered twice the amount of gas he used. If you asked a lawyer or a parliamentary draughtsman, he would say, "Let me see your Act," and, of course, from a legal point of view, he would be right. "And there's the rub."

Now I have, I think, formed my own conclusions in the matter, and will deal with them shortly, but what strikes me most forcibly is the extreme urgency and importance of this subject, and the necessity that gas makers should come to some universal or rather united point of view, and take steps accordingly, because the matter is one which gets more complex with every new Act, and is not one of which it can be said "*solvitur in ambulando*."

TABLE C.

Showing Results of Testing the Five Different Gases (set out in Table B) in the Eight Different Ways (set out in Table A).

Kind of Gas (See Table B).	Methods of Testing (See Table A).								Calorific Power in B.Th.U. per c. ft. (gross).	Light from Mantle per c. ft. per hour. Candles.	Specific Gravity Air = 1.
	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.			
A (16)	15·63	*15·8*	15·95	15·0	18·13	15·19	16·66	17·65	608	22·0	0·50
B (15)	13·4	15·0	15·0	14·24	16·75	*14·4*	15·9	15·9	592	20·0	0·53
C (14)	11·1	13·87	13·73	12·84	15·35	11·92	*14·3*	*14·5*	592	19·1	0·41
D (14)	10·7	13·3	*13·65*	12·7	14·9	11·73	13·56	14·45	576	19·0	0·44
E (14)	9·45	13·47	13·6	12·4	*14·5*	10·7	13·71	14·64	580	17·2	0·405

Looked at from an individual point of view, the answer to my question is simple enough. Each gas is tested according to parliamentary bargain, and each gas maker has the right—nay, the duty—to get from Parliament the best bargain he can. From that point of view, of course, no comparison can be made between gas in one district and gas in another. I do not know that this would matter very much, although very unsatisfactory professionally; but the fact cannot be overlooked that the Board of Trade recognize the unsatisfactoriness of this comprehensive muddle, a Departmental Committee of unknown views is sitting, and one never knows what general changes the future may have in store. Therefore, I say (this matter being practically *sub judice*) a policy of cohesion is necessary, and a scheme put forward officially which shall represent the views on testing of the entire gas interests.

Let me just run through a few Acts which I have set forth. Suppose the Board of Trade prescribe a 14-candle flame; where is the man going to be who now tests with a 16-candle flame and whose Act says his method is governed by that which shall be approved by the Board of Trade? As you will see from the figures given, there is a loss of about 1 candle. Suppose the Referees say all gas in London shall be tested irrespective of its standard quality in the same burner and chimney at a 5 cubic foot rate. Where is the man going to be whose Act says he is governed by what obtains in London? Why, his apparent candle power would be knocked down from (say) 14 to 10 or 11 candles, with just the same gas [see diagram]. Suppose the Board of Trade say the best point of efficiency for which the argand burner was designed was using it at a 5 cubic foot rate. Where is the man going to be whose Act says he is to use the burner at the best point of efficiency it was designed for? Again, see diagram. These are but one or two possibilities, and I will hasten to tell you what I think is a fair, what I know is a scientifically accurate, and what I believe to be a logical system to adopt.

We must first, however, make two assumptions. One is that it is obviously impracticable for all gas-makers to make the same quality of gas and by the same method; for if this were possible, of course, all testing differences would vanish. The second is one which, perhaps, you will say is a large one. We will assume that gas-testing by photometry, as we understand the term, is a necessity. The argument of this question is too lengthy a process for my present purpose, but at any rate, before we depose "King Candle," we must have another monarch, or (say, to satisfy republicans) another constitutional system ready. Whether "President Calorie" is a proper substitute, it is not, I say, my purpose to inquire; but however that may be, at the present time testing in a photometer is the official system, the system that fines, the system that shackles, the system that confuses, the system that is no system, but a legion. This being so, how, saving abolition, can it be straightened?

I say straight off that I put special burners on one side. Although, as you see, the Wandsworth burner yields consistently the highest result, it is a bad burner from the consumer's point of view, as its character of flame is distinctly defective, and it is an inelastic burner. Moreover, when once you introduce new burners, where are you going to stop? I could produce you now an argand burner which would give you results at least $1\frac{1}{2}$ candles higher than the Wandsworth burner.

No one desires—there would be no point in doing so—that gas which to-day is called 14 candles, shall to-morrow be called 17 candles; but what many want is that if they reduce their power by two candles, that reduction shall actually show by two candles—no more, no less—in their testings, or that if they make carburetted water gas, the advantage of the enrichment shall not be thrown away in the testing.

Very well then, these are some of the reasons why I should put special burners on one side. I keep to the 24-hole argand with a 6 inch by 2 inch chimney, because—(1) It is practically the only standard burner. (2) It is a burner capable of burning gases of different powers over a large range. [The tests I have put before you show that you can burn from a $9\frac{1}{2}$-candle flame to a 24-candle flame in this burner.] (3) It is a burner evidently suitable for the consumer's use; can be bought by a consumer at quite a small price; and, moreover, it is one on which all our notions of candle power are based. (4) It is so designed that, used in a consistent way, I believe it to yield consistent and comparable results with gases of different qualities; and I believe that with Mr. Sugg the credit still remains of having designed the best testing-burner.

Now if, using my tests as a guide, we try and find out why the argand burner used in different ways yields such different results; if, as I say, we discover the reasons—we shall be appreciably nearer to the discovery of the solution, to the answer to the question, What is illuminating power?

The first reason is, of course, that different qualities of gas give a different efficiency per foot consumed. The second reason is that, acting side by side with the first, different sizes of flame in the burner yield, quite apart from the quality of the gas, different efficiencies per foot, due to the burner *per se*. The third reason is, succinctly, carburetted water gas.

Obviously, an ideal burner would be one showing the same efficiency per cubic foot for a gas, whether it were burned at a 5-foot rate, at any flame value, or so as to fill the chimney. But such a burner has yet to be made; and the making would present great difficulties.

Now, even at the risk of labouring an elementary fact, I want to make it clear what I mean by a varying efficiency of burner *per se*. Take the calculation known as pounds of sperm per ton, which is arrived at by multiplying the make per ton by its "candle-power," then by $\frac{3}{1750}$ lbs. (120 grains of sperm per hour) and dividing by 5 on account of the 5-foot rate to which the expression "candle power" is reduced. Express in this way your make of coal gas, burning the gas at a 5-foot rate in a London argand with 6 inch by 2 inch chimney. Do the same thing with your carburetted water gas, and then the same with the mixed gas. You will not find the mixture agree with the sum of the two components in proportion to the quantities used, because the "burner efficiency" is not the same for the plain gas, the carburetted water gas, and the mixed gas. That, I think, makes clear what I mean by "burner efficiency."

There is, however, a way of using the "London" argand with a 6 inch by 2 inch chimney which does give the same burner efficiency, whatever (within practical limits) the gas tested. The way is an old way; the method long ago advocated by, I think, such a distinguished authority as Mr. Charles Hunt—viz., to burn the gas at such a rate as will give a full flame in the chimney, the result, reduced to 5-feet rate, being, of course, inversely proportional to the gas used per hour.

That is a method which I believe would give fair and comparable results for all gases which can be tested in an argand at all; and it is the advocacy of this method which I most strenuously recommend.

It is easy to explain why this should be so. It is because in every case the flame would be of approximately the same size and area, and consequently the amount of air supplied for its oxygenation would be approximately the same in each case.

The only disturbing element is the different flame heats, and as we are dealing with illuminating powers of comparatively small range, and therefore a small range of flame-heat, the inaccuracy may be disregarded as being inconsiderable.

It is the air supply, and to a minor extent differing gravity, which is the cause of the variations shown in the figures before you and in the chart exhibited. Let me just run through these, leaving out special burners for the reasons given above.

The 5-foot rate tests are, as you see, very low—very much lower and less consistent than the full-flame test, lower even with gas No. 1 than the 16-candle flame, because that gas contains water gas. If you recollect, when 16-candle gas in the argand burner at a 5-foot rate was universal, it was in the days when all gas was of similar make, and when a 5-foot rate gave always a 3-inch flame and a light of 16 candles. It was in the days when the illuminating power meter was designed, and when the jet photometer was largely used—when, in fact, there was a ratio between the height of the flame and the candle power, and when this ratio existed in an argand burner, as stated above.

So soon as you drop the illuminating power of the gas, you no longer get a 3-inch flame, but a shorter one; and consequently an over-oxygenation of the flame, and a consequent unfair deterioration in the apparent quality of the gas. Again, if you were making 16-candle coal gas, you had a 3-inch flame, 16-candle light, 5 cubic feet per hour; but so soon as you made a 16-candle mixture with water gas, you got the same light, the same rate of gas, but perhaps a $2\frac{1}{4}$-inch flame. So that again there is the unfair deterioration in the apparent quality of the gas by over-oxygenation. If we grasp this fact, we have the keynote to the whole thing.

Take the 16-candle flame value. Here the unfairness applies just the same to gas enriched with carburetted water gas or to gas of (say) 18-candle quality. The tests show the same inconsistency, and for precisely the same simple reason.

Take the 3-inch flame. This would be fair enough; but then a 3-inch flame is a difficult thing to gauge. A tester in the district would perhaps gauge to the mean of the tips. A tester on the works would perhaps have his photometer in such an unsuitable room (when will gas managers appreciate that the room is the photometer?) that there was a stray tip or two tailing up, and he would gauge perhaps to the bottom, or perhaps to the top of these. Result: A different reading to the district; confusion; inconsistency; a possible fine.

As to the use of another chimney. Another chimney means another burner, which is again a departure from the logical line, for the chimney is an integral part of the burner.

Come, then, to the full flame. Here is a thing easy to gauge; easy to regulate; and which, whatever the gas, ensures, at any rate, equal oxygenation of the flame. I say that, looking at the results I put before you, there is a broad consistency shown by the results under this method; and these results only confirm an opinion long held by me, and founded, I believe, on strict logic and sound reasoning. It may be that the adoption of such a method would mean a slight readjustment of the nomenclature of our candle power; but even if this were necessary, after it was done we should be in a condition when qualities of gas would be comparable and possess a valuable meaning, which is more than can be said at present.

I think, while I am on the subject of consistent results, I should once more point out that you can get almost as great divergence in results as are shown above by burning the gas in the same burner, in the same manner, but in different rooms, unless you pay particular attention to the ventilation of the rooms. If I have shown to your satisfaction that the air supply has a great

influence, just imagine for a moment that the room is a chimney, and think what a difference in oxygenation of a flame you get with different quantities of air per hour passing up this chimney. I have dwelt on this subject in my revision of Mr. Hartley's "Gas Manual;" I mention it here for emphasis, because it has a most important bearing on the quality shown, and consequently on enrichment, or make per ton, and thus on dividends. This is no fancy picture—I could prove it, had I time, by chapter and verse, and do strongly commend it to your attention.

I want to deal with one other matter, and then I have done. Assuming the feasibility of gas managers initiating, as I have suggested, a combined policy—of dropping a policy of slide or an individual policy—then I think if we want consistency, we must have one standard of light. I am suggesting the 10-candle pentane standard. You may take it from me, gentlemen, that there is no better standard of light extant than the Harcourt 10-candle pentane lamp; and, although like all standards derived from combustion, it is affected by atmospheric conditions, yet any changes in illuminating power from such causes can only be perceived when the lamp is in comparison with a light not so affected, and this, of course, is not the case when gaslights are being measured. Such a change would not necessitate the table photometer—it could be brought about with ease, and would, I feel sure, be another step in the direction of reliability.

In conclusion (and I fancy I can almost see your sighs of relief at that blessed word), I have only touched the fringe of a very complex subject; but I have considered the question without bias and from an absolutely outside point of view, and if the recommendation I have made appears to coincide with what is often called the gas company's point of view, it is by plain accident and not by design. That I have not ontwardly, at any rate, argued this matter from a local authority's or consumer's point of view, might be urged; but I hold that to free a large industry like yours from ridiculous, illogical shackles, which sap its energy and stem the tide of technical progress, is considering both the local authority and the consumer. The more efficient a gas company, the better served is the public—both individually and collectively; and to descend from generalization to particularization, the incandescent burner and calorific tests that I have put before you show that the public does not suffer much whichever way the gas is tested. Therefore let gas makers, who are, after all, those most interested, think of the old Roman *fasces* typical of the fact that "Union is Strength." Let them make up their minds what they want, and, above all, see that they get it.

The PRESIDENT said he thought the members would agree with him that they were all very much indebted to Mr. Abady for his most interesting lecture. It was a subject which had of late to a very great extent been neglected in view of many of them being occupied with the question of calories. In his mind they could not but agree with the lecturer that the gas engineers of the present day should make a determined stand upon the subject, and form an opinion as to what they really did want. Mr. Abady had put this to them most forcibly, and at the same time most plainly.

VOTES OF THANKS.

Mr. T. BOWER (West Hartlepool) proposed a hearty vote of thanks to Mr. Hovey for his supplementary paper, and also to Mr. Abady for his lecture. As to the paper, he did not think there would be more than one opinion upon it; and the only word by which they could describe both his previous contribution and the supplementary one was "excellent." The older members of the Association would probably remember that these were not the only papers of a constructional character which had been put before the Association. Some years ago (in 1887 or 1888), a late President of the Association—Mr. Wyatt—gave a somewhat similar paper, but on very general lines, as to the detailed cost of construction of gas-works. The paper, he knew from experience, had many times been referred to, not only from a constructional point of view, but for comparison in parliamentary matters. This paper of Mr. Hovey's, put before them at the last meeting, while somewhat similar to that he had described, was one which would still further add to the usefulness of the Association, by placing on record what many of them desired to get in a concise form—that was, some sort of comparison in constructional work when they were considering what should be done in their own individual cases. It was on this account that he thought Mr. Hovey had placed the Association and its members under a very deep debt of gratitude, in preparing the elaborate details which he had put before them. There was another point in connection with the paper which he should like to name—that was the fact that many of the members at times found difficulty in getting directors and corporation committees to see the necessity for additional capital expenditure. Now, if they came organized, and put before their committees the fact that they had, from actual experience here, an expenditure of money which had realized 27·7 per cent. upon its outlay, all he could say was that the directors or committee men who would not be guided by evidence of this description were very dense. As to the lecture they had had from Mr. Abady, it had been exceedingly interesting, and one which would cause them, no doubt, to reflect as to what was best to be done trying to remove some of the discrepancies described to them that day. He was recently interested in a case before Parliament where an official who had tested the gas for a company was prepared to swear that on no occasion had it been less than 16¼ candles, and an equally able official, who had examined on behalf of a corporation, was prepared to swear that the same gas, on the same day—the only difference being that there was three-quarters of a mile difference in the testing-stations—was quite 2½ candles below that which the gas official was prepared to take his oath it was. Now, the matters before the Association that day would, to some extent, lead them to think more about this question, and to adopt the suggestions which the lecturer put before them; and he had no doubt whatever that they would accord the hearty vote of thanks he proposed; and thereby uphold the dignity of the Association.

Mr. WALKER, in seconding, said there was just one thing he should add, and that was to congratulate Mr. Hovey on having such a Chief, and to congratulate Mr. Hardie on having such an Assistant. As regarded Mr. Abady's lecture, he was sure he could have gone on for another hour or so, with profit to them. He was sure the next time he felt inclined to come North and continue the subject of photometry, he would have a very willing audience there.

The motion was agreed to.

Mr. HOVEY thanked them very much for the kind way in which they had received his paper. He was deeply conscious of the imperfect manner in which he had described the various details, and also the imperfections of the details themselves. The value of his contribution might not be so great as was anticipated; but he had given them actual particulars of outlay and working results extending over a considerable period. He might mention that the price of gas in North Shields, in spite of the considerable capital expenditure which had been made, was at the present time at a lower figure than it had ever been previously. Before the end of the year, a further reduction would be made; and the net price charged over the whole district, to ordinary consumers, would not exceed 2s. per 1000 cubic feet, and the lowest price charged to consumers like the Tynemouth Corporation and the Whitley and Monkseaton District Council would be 1s. 8d. Thus, in spite of the large expenditure, they were in a better position, and the Company were better able to meet the competition of two electric light undertakings which had, more or less, a network of connections in the district. In everything he had done in the matter of his paper, he wished to couple the name of his Chief (Mr. Hardie), without whose permission, and without whose supervision, it would have been impossible for him to have given the particulars which he had.

Mr. ABADY said that while he was on his feet again, it would be a very great temptation to him to mention one or two other points which he now recollected he had omitted, and which he considered were absolutely vital to the whole argument. But perhaps that would be hitting below the belt; and so he simply wished to thank them, and to say that if any further contribution from him would be of service he would be delighted to fall in with any suggestions they might make.

ELECTION OF OFFICERS, &c.

The PRESIDENT announced, as the result of the ballot, that the following had been elected Officers for the year:—

President—Mr. E. E. J. Anderson, of Middleton, Lancashire.
Vice-President—Mr. Matthew Leaf, of York.
Auditor—Mr. C. H. Armstrong, of Wallsend.
Hon. Secretary—Mr. Herbert Lees, of Hexham.
Members of Committee—Mr. A. Allan, of Scarborough; Mr. A. B. Tobey, of Durham; and Mr. W. Doig Gibb, of Newcastle.

PLACE OF NEXT MEETING.

It was intimated that the next place of meeting would be Harrogate.

VOTES OF THANKS.

On the motion of Mr. J. H. PENNEY (South Shields), a vote of thanks was accorded to the Committee for their valuable services during the past year; and on the motion of Mr. W. HARDIE, a similar compliment was paid to Mr. Tarratt, the President, for the way in which he had filled the office.

These felicitations were suitably acknowledged; and the proceedings terminated.

The members of the Association and friends dined together in the County Hotel—Mr. Tarratt in the chair. The health of the Hon. Secretary was proposed by Mr. W. Ford (Stockton). Mr. A. B. Walker said the President desired him to say that Mr. Lees stepped into the breach in connection with the class of technical education. He could assure them, from having been present at the class on more than one occasion, that the students appreciated Mr. Lees' efforts on their behalf. The President had asked him to mention this, because Mr. Lees had got them out of what might be termed "a hole" in this matter. They recognized that, in conducting the classes, Mr. Lees rendered services not only to the Association, but to the gas industry in the North. He was, therefore, asked to couple with the toast Mr. Lees' name as "Teacher of the Class on Gas Manufacture in the Rutherford College." The toast was cordially accepted, and was acknowledged by Mr. Lees.

PROGRESS IN GAS MANUFACTURE IN ENGLAND AND AMERICA.

We conclude this week the extracts from Mr. Irvin Butterworth's "Progress Report" to the Ohio Gaslight Association, of which the first part appeared in the last issue of the "JOURNAL" (p. 230).

PRODUCER GAS.

Progress has been made during the year in the manufacture and application of producer gas; but for prudential reasons announcement cannot yet be made of some of the improvements. Standard producers are being arranged for the use of bituminous coal; and there has been introduced a small suction gas-producer, using anthracite or coke, of sizes as low as 10-horse power. These suction producers operate without a gasholder, and are coming into special favour in Germany and France. Several plants are now making producer gas out of wood. Methods of producer gas manufacture are becoming more flexible, adapting the plants to the manufacture of various kinds of gases, according to the purposes for which they are to be used.

FUEL ECONOMIZERS.

The manufacturers of a well-known fuel economizer adapted for use in connection with water-gas plants, report that they have made several improvements therein during the past year. At Madison (Wisconsin), 12 per cent. of the boiler fuel is saved by heating the boiler feed-water with the exhaust gases from a large gas-engine that is used for generating electric current.

OIL-GAS APPARATUS AND PROCESSES.

These are used chiefly in California with the heavy oils now being produced there in large quantity. The gas-works employing the latest oil-gas apparatus use no solid fuel whatever, except the coke that is made from the oil itself in the process of manufacture, which coke is used under the boilers. During the past year, an economical method has been discovered for coking the lamp-black with which the gas made from this oil is heavily charged. The coke made from the lamp-black in an oil-gas works having a capacity of 30,000 feet per day or over is sufficient to generate all the steam used in the works. The oil-gas apparatus, as made by one concern, is simply a modification of the ordinary water-gas apparatus, in which the generator is omitted altogether; its place being taken by two carburettors with special design of chequer-brick and burners, and having a scrubber of special design, made necessary by the large quantity of lamp-black which the crude gas contains. The total consumption of oil per 1000 cubic feet of finished gas is about 11 gallons. About forty Californian cities and towns are now being supplied with this oil gas, some of them among the largest in the State; and the total increase in oil-gas production during last year is about 2 million cubic feet per day.

EXHAUSTERS.

No radical improvements in exhausters have been made during the past year; but some very large units have been built. One that has recently been installed in a gas-works in a large Western city has a displacement of 52 cubic feet per revolution, and is direct-connected to a high-speed Westinghouse gas-engine of 300-horse power, designed to run at the rate of 200 revolutions per minute against a 5 lb. pressure, pumping 8000 to 10,000 cubic feet of gas per minute into medium pressure gas-mains. Another large exhauster built last year has a displacement of 300 cubic feet per revolution, is designed to operate against 4 lbs. pressure, and weighs 140,000 lbs. Experience is said to show that these large units operate against pressures up to 5 lbs. with about 75 per cent. of the power required for piston machines of the same capacity. A Pittsburg concern has brought out a new exhauster speed regulator; and the manager of an Eastern gas company has also recently adopted an improved device for this purpose.

PROSPECTIVE PROCESSES.

There is some quiet talk on both sides of the water about the proposed manufacture of a gas similar to natural gas, consisting chiefly of methane or marsh gas; and a patent was taken out in England last year for a process of this sort. Another process is promised that will completely gasify any carbonaceous material. The Mazza separator (an Italian invention) is being discussed, which is said to enrich air with oxygen by a centrifugal mechanism that takes advantage of the different gravities of the constituents of the atmosphere. The inventors claim that a saving of 22 per cent. in boiler fuel has been effected by supplying the boiler with air thus enriched.

BYE-PRODUCTS COKE-OVENS.

Improvements during the past year in bye-products coke-oven apparatus consist of machines for levelling the coal in the ovens, formerly done by hand, and an apparatus for the more effective control or separation of the gases evolved in the coking process, especially when a portion of same is to be used for illuminating purposes. There are now 341 more ovens in operation in this country than there were on Jan. 1, 1903. Several thousand bye-product coke-ovens are now being built in Europe; and the following is a list of new ovens being built in this country, including additions to plants already in operation: Buffalo (N.Y.), 564; Chester (Pa.), 40; Chicago (Ill.), 120; Cleveland (Ohio), 66; Duluth (Minn.), 50; Dunbar (Pa.), 30; Geneva (N.Y.), 30; Lebanon (Pa.), 90; Milwaukee (Wis.), 80; South Sharon (Pa.), 140; Tuscaloosa (Ala.), 40; total, 1250.

TAR.

Some use has been made of tar in Europe during the past year for laying dust on roads. The use of tar for the manufacture of tar macadam for street-paving purposes is also increasing in this country. Experiments are being made, with promising prospects, in the use of tar for the manufacture of briquettes for fuel. The American Coal-Products Company estimate that the total tar production of 1904 in this country will be 40 per cent. more than it was in 1903. The manufacturers of a well-known bitulithic pavement report the rapid increase in their business as follows: In 1901, 14,400 square yards; in 1902, 255,000 square yards; and in 1903, 901,000 square yards.

QUICK SULPHUR DETERMINATIONS.

Two or three methods for making quick sulphur determinations of coal and coke are being, or have been, developed during the past year; and one of them is described in the "American Gaslight Journal" of June 11, 1903, which admits of two or three complete determinations per hour. One of the other methods will be announced later this year by the discoverer.

GAS DISTRIBUTION.

The past year has witnessed an increased use of high-pressure gas distribution, which seems to be coming into general favour. No noteworthy improvements, however, have been made in the appliances used in this system of distribution. One company has devised a very simple but effective high-pressure street-lamp regulator. In a large Eastern city, bell-and-spigot cast-iron pipe is being laid for the transmission of gas at 10 lbs. pressure; the pipe being tested at 20 lbs. In a large city in the middle West, gas is being distributed through three different systems of piping, each at a different pressure; the suburbs being supplied with very high pressure gas through small wrought-iron mains, and the extremes of the low-pressure system being reinforced by special cast-iron feeders from the works, carrying gas at 5 lbs. pressure—automatic reducing pressure governors being used where these systems connect into each other. In Greeley (Colo.) a novel high-pressure system of both manufacture and distribution is in experimental operation. The gas is of about 100-candle power when made, and is then pumped into a tank at 120 lbs. maximum pressure, whence it is passed into the distributing holder, which automatically injects sufficient air into the gas to dilute it to 20-candle power before it passes on to the consumers through 10 miles of small distributing mains.

METERS.

No improvements have been made in gas-meters during last year, beyond those pertaining to factory details, excepting some minor improvements in the drums of station meters. A patent was taken out in England for an improvement in the rotary meter brought out a year or two ago. A well-known prepayment attachment has been improved by the addition of a device (furnished only when ordered), which is said to prevent attempts to "beat" it. The use of the prepayment attachment and of the prepayment meter is said to be increasing. The manufacturers of the straight-reading meter-dial, referred to in last year's "Progress Report," are ready to make deliveries. Ordinary meters equipped with these dials cost 30 c. extra. A meter has been brought out in England that simultaneously records the quantity and pressure of the passing gas.

INCANDESCENT GAS LIGHTING.

The following improvements and progress have been made during the past year in incandescent gas lighting and appliances: (1) Increased use of the yellow or mellow-tinted mantle in place of the white. (2) Increased use of high-grade mantles, and of mantles equipped with carriers. (3) Mantles are gradually being strengthened and hardened, making them less fragile and longer lived. (4) Adjustable gas-checks of various kinds are coming into more general use, conducing to better results under varying pressures. (5) Improvement in the materials of which chimneys are made, conducing to their more general use in place of the so-called "cylinder" chimneys, which give lower efficiency. (6) Increased use of small mantles and burners, consuming half as much gas and giving half as much light as the ordinary-sized mantle, and better adapted to domestic and decorative lighting, also producing less heat and discoloration. (7) Centre pilot-jet bye-pass, which gives a flame that is less likely to be blown out than with the older form, burns an extremely small quantity of gas, and automatically turns low while the mantle is burning full. (8) Development of large units burning 6 to 12 cubic feet of gas, specially constructed for use with air-hole chimneys; the shades being supported by side-rods independently of the chimney. The air-holes in the chimneys throw the surrounding air directly upon the mantle, permitting the consumption of more gas and producing a larger light, but with a sacrifice of efficiency. (9) Improvements in out-door lamps as follows: Ball-and-socket joint that serves as an anti-vibration

device, decreasing the breakage of mantles, and greatly facilitating the hanging and trimming of the lamp. Arrangement for protecting mantles while trimming. Means for easily renewing one mantle without exposing the other three. Easy means for cleaning the feed-pipe and globe. Arrangement for hanging globe on supports while trimming lamp. Device for preventing wind from producing down-draughts through the lamp. Air-ports of bunsen tubes protected by gauze, thus preventing the flashing-back of the flame. Easy removal of globe without the removal of the globe-holder. A guard for protecting the mantles from breakage by the removal of the globe, or by wind. Drip-cup for condensation. (10) A new adjustable burner, known as the "Tirrill," made in New York. (11) The Lucas lamp, mentioned in last year's progress report, has been improved, and is now made in units as large as 1000-candle power. (12) The invention of the "Millennium" high-pressure and high candle power lamp, made in very large units, and now introduced considerably for lighting streets in Germany, with very promising success. The larger sizes consume as much as 42 cubic feet of gas per hour, yielding 1315-candle power. (13) The invention of the "Taj" burners, running as high as 1000-candle power. (14) The improvement of the Plaissetty mantle, which promises much toughness, durability, and high candle power. (15) The d'Heureuse mantle, which is woven instead of knitted, resulting in greater strength and increased ability to withstand shocks, and minimizing shrinkage. (16) The development of the Scott-Snell lamp for street lighting; the water-chamber being discarded, and the lamp being otherwise improved. This system is being tried in several English cities, with promising results. (17) The increase in the adoption of the inspection and maintenance system of looking after mantles and burners by gas companies. The South Metropolitan Company, of London, now have a force of about seventy men engaged on this work. (18) The development of the Keith system of intensified incandescent gas lighting, which also is being introduced in England. (19) The development and improvement of various other makes of high candle-power lamps. (20) A system of lighting and extinguishing gas street-lamps by raising and lowering the gas pressure has been perfected in England, which has thus far successfully withstood practical tests. (21) Better means for regulating both gas and air supplies to high candle-power lamps. (22) An improvement and cheapening of the mantle which is so made as to automatically light the gas when it is turned on. (23) Inverted incandescent mantle burners have been perfected to a commercial success, permitting decorative effects, and producing no shadows. These lamps are about to be pushed in this country. There seems to have been no improvement or progress in this country in incandescent gas street-lamps for burners, or in incandescent gas street lighting. In Europe street lighting by gas is making rapid headway.

Mica Chimneys and Canopies.

Mica chimneys have been improved during the year by making them so that air is drawn in at the base, either through perforations near the base or through an open space between the chimney and an inner collar, thus making them adapted to the use of large mantles requiring additional air supply; and they have become somewhat popular. A combined chimney and canopy is also being made of mica for small lights.

Holophane Globes.

Holophane globes were made in greater variety last year than ever; and the finish of the glassware is being improved. Their popularity continues to increase; the manufacturers claiming a gain in sales of 50 per cent. over those of the preceding year.

Gas-Ranges.

The following progress in gas-ranges can be recorded for the year: The invention and perfecting of a split-top burner that is said to prevent the flame from "wavering" or producing an odour, and which is easily cleaned and cannot leak at the joint. Valves that are quickly adjustable by the operator to varying gas pressures, and so made as to keep the orifices free from foreign substances. One concern has patented a broiling and roasting screen that slides in immediately under the oven-burners, and protects the foods from burning and from the smudge and dirt due to dripping fat, &c. Two concerns have found it best to so change their ranges as to admit of sweeping underneath them; and one of them has devised a drop-oven shelf for the upper oven. Another has improved its oven-bottoms, broilers, and drip-pans, and has substituted steel panels for cast iron in the drop-doors. It is also using refined instead of japanned iron for the bodies; and to fill a certain demand is making a plain range, devoid of all ornamentation. Ranges with elevated ovens and broilers are coming into more general use. There seems to be no diminution in the number of gas-ranges manufactured yearly; and at least two additional factories have been put into operation during the past twelve months.

Gas Water-Heaters.

There has been brought out and put upon the market during the year a departure in the shape of an all-copper gas water-heater, in which the gas-flame and products of combustion pass through the tubes on the same plan as the steam automobile boiler, instead of the water flowing through the tubes as in the ordinary construction. The entire heater is without casing of any description. The makers are of the opinion that copper or brass are the only materials of which water-heaters should be made. Another concern has improved its heaters by making the castings thinner. Water-heaters are coming into more general use, and additional factories are taking up their manufacture.

Gas-Heaters.

One concern has placed upon the market during the past year what it calls "an odourless and base-heating gas-stove," in which the burner is overhung with a fire-brick cone that is said to make this form of heater give out a larger proportion of the heat in the form of radiant heat than is done by any other gas-heater.

Gas-Engines.

As was the case during 1902, the greatest progress in the gas business during the past year has been in the use and construction of gas-engines. The following table, showing the number of engines of 1000-horse power, or over, manufactured or contracted for by five of the great firms of Continental Europe, gives an idea of the rate at which the use of gas-engines is increasing:—

Year.	No. of Engines.	Total Horse Power
1900	2	2,000
1901	2	2,000
1902	9	11,400
1903	11	13,100
1904 (Contracted for)	62	90,000

Of this list, eight are run on producer gas (seven specified as Mond gas), two on coke-oven gas, and the balance on blast-furnace gas. The Lackawana Steel Company, at Buffalo, are now installing nine 1000-horse power gas-engines.

Although none of these very large units are used with ordinary illuminating gas, yet the use of small units for illuminating gas is also increasing rapidly. It is stated that 50,000 gas-engines of one comparatively recent make are now in use; and it is also said that there are now more gas-engines being made than steam-engines. There has been considerable development in the horizontal double-acting engines of the twin-tandem double-crank design. A very large number of the latter are being installed for direct connection to alternating-current generators to operate in parallel, which indicates the degree of refinement that has been reached in the matter of regulation. A firm in this country is prepared to build 4000-horse power gas-engines of this type. One gas-engine expert reports that the most significant improvement of the past year is the rapid advance in favour of the two-cycle engine, which is now receiving great attention, especially in Germany. As to improvements in detail, one concern has adopted a solid cylinder-head, which prevents the possibility of water leaking from the water-jacket into the explosion chamber. The cap which covers the cylinder-head is also made thin and shell-like; so that if water carelessly left in the jacket should freeze, the jacket-head will burst, thus avoiding damage to the cylinder proper. An auxiliary exhaust has been added, also the strap style of connecting-rod, which is less liable to break than other forms, and which lends itself to the easy taking up of the wear of the boxes. One engine-builder predicts that the two-cylinder vertical engine will cut quite a figure in the use of artificial gas, because it is adapted for use in buildings in densely populated portions of cities where gasoline engines would be prohibited. Considerable attention has been given during the past year to problems relating to the cooling of gas-engine cylinders. Compound gas-engines have also been tried during the year, but without flattering success thus far. There seem to have been no larger sizes of gas-engines made in 1903 than were made in 1902. One engine-building firm in this country is constructing a 1300-horse power engine.

The current year promises many interesting developments in gas-engines, as inventors and experts are busy upon improvements and new types. An experimental engine has been built by one concern, a trial of which indicates that, when perfected, it will have a thermal efficiency of 45 to 50 per cent. Many experimenters are working upon the gas-turbine; and there are rumours that the problem of a successful gas-turbine has been solved, though there is nothing more definite to report as yet. It is said that the General Electric Company are now making extensive experiments with this form of motor.

Electrolysis.

No progress worth mentioning has been made during the year either in the development of means for the prevention of electrolysis of gas-pipes, or by the Courts in fixing the responsibility for damages from such electrolysis as between the gas companies and the electric street railway companies. The manufacturer of a well-known coupling recommends it for the prevention of electrolysis of service-pipes.

Acetylene Lighting.

That acetylene lighting is making progress, is shown by the following figures, which give the number of acetylene town plants installed in the United States in the past six years: 1898, 4; 1899, 4; 1900, 10; 1901, 21; 1902, 21; 1903, 62—total to date, 122. It will be observed that more towns were thus equipped during the past year than in the preceding five years. There seems to be little field for acetylene lighting, however, in cities and towns supplied with ordinary coal or water gas.

Some Odds and Ends of the Past Year.

(1) The Fall River (Mass.) and the Charlotte (N. C.) Gas Companies have steam-turbine blowers in their water-gas plants. (2) The Milwaukee Gaslight Company have an emergency stop-box for hollow sidewalks that is giving great satisfaction. (3) The Pawtucket (R. I.) Gas Company employ a Westinghouse pump for scurfing retorts. (4) The Burlington (Vt.) Gas Company use a Barnum respirator with much satisfaction. (5) A new form of saw has been put into use during the year for sawing the slots in lava tips, resulting in greater accuracy and smoothness of the slots. (6) The cloth strainers between the check and the tip of a well-known check burner are now being held in position by steel rings instead of cement. (7) The American Radiator Company, of Chicago, are making steam and hot water house-heating boilers especially adapted for the use of gas coke. (8) Oval-way gas-cocks are now being manufactured. (9) Cast-iron pipes are now being so made as to fit a well-known make of pipe-couplings. (10) A well-known gas-main stopper has been improved by the use of a more perfect spring. (11) One large gas company are discussing the advisability of purchasing coal lands for their own supply of gas coal. (12) Coal gas is being used for lighting the coaches of the Western Railway of France. (13) A machine has been brought out that very quickly removes broken taps. (14) A British patent has been granted for a turbine to be operated by the exhaust from an internal combustion engine. (15) A patent has been applied for in this country on a pneumatic device for firing bench furnaces with pulverized coal or coke. (16) A service-pipe thawing-machine has been recently patented and put into use. (17) A device has been developed and successfully tried, on a working scale, for automatically weighing coal charges into inclined retorts, instead of measuring them. (18) Gas-engines operating pumps are now used at the Philadelphia Water-Works for increasing the water-pressure in the mains at times of fires.

PROTECTING PIPES AGAINST ELECTROLYSIS.

American Suggestions.

In America, if anywhere, gas engineers should know something about electrolysis, and the methods of protection against this form of injury to their distribution systems. A couple of inquiries referring to the subject are found in the volume (which has been under notice in the "Journal") dealing with the "Question-Box" of the Ohio Gaslight Association. The matter is one of special importance to gas and water engineers of this country at the present time; and therefore we give *in extenso* these particular questions and the answers which they evoked. The first question is this: "Is cement an absolute protection against electrolysis; and, if so, what thickness is required to protect the pipe?" The second is, "Is there any other substance equally as good as cement for pipe coating and proof against electrolysis?"

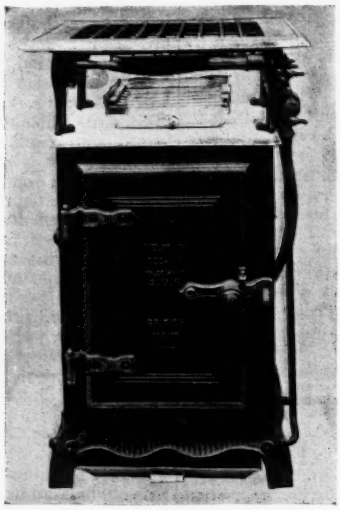
Upon the first question, Mr. J. M. Humiston writes: "It is presumed that by the word 'cement' is meant a concrete of one of the better brands of Portland cement. Such an envelope is not an absolute protection against electrolysis. Its efficiency would depend on the proportion of cement employed, the intimacy of the mixture, and the amount of moisture in the soil in which the pipe thus protected was laid. With a concrete an inch thick of one part high-grade cement, two parts of sand, and three parts of ½-inch stone, mixed, and laid carefully, I do not believe an efficiency above 60 per cent. could be secured. By this, I mean that a pipe so protected and subjected to the same influences as a bare pipe would last two-and-a-half times as long as the bare pipe. Such construction for a 4-inch wrought-iron pipe would cost $11·70 per 100 feet. Assuming that cement, sand, and stone cost respectively $2·25 per barrel, and $1·60 and $1·50 per yard, and that the common hemlock lumber for a 1-inch pine box cost $17 per M. It would be necessary to use the box, as without it the mixture could not be tamped with sufficient firmness about the pipe. The only instance where I know of such construction being employed was one in which the Pintsch Compressing Company laid a 1-inch extra heavy pipe under the South Side Elevated Railway in Chicago from 44th Street to 40th Street, a distance of about ½ mile; the Elevated Railway at 40th Street, the nearest point, being about 1500 feet from the power station. The pipe was laid substantially as specified above, and was finished in November several years ago. The following October when the gas was turned on, the line being out of service during the summer months, the pipe failed to hold the pressure, which was 150 lbs. Mr. C. H. Peterson, who supervised the work and observed the results, told me that they were obliged to take up ½ mile of pipe, which was almost totally destroyed." Mr. Clarence S. Lomax says: "In order to be a perfect protection against electrolysis, the cement must be free from cracks. The thickness, therefore, will vary with the size of the pipe, and manner of laying the same." Remarks Mr. Mastin Simpson: "I doubt if this question can be answered as it should be. I have never yet found men who would either coat with rubber pipe coating or with cement and pipe sufficiently well to determine the question in hand. Furthermore, a little rust, a little oil, an unclean spot on the pipe will destroy the entire value of the cement or coating. Furthermore, the use of the tools leaves the pipe in condition so that it is readily attacked at the weak points, and the expense of the coating has been thrown away." Mr. J. H. Fitzgerald observes: "I am not qualified to say that cement is an absolute protection, but I am convinced that it is a very great protection." Mr. J. D. Shattuck believes "¼ inch thickness of cement to be an absolute protection against electrolysis;" while Mr. J. D. von Maur says that "if a pipe is covered with cement ½ inch, or even less, in thickness, it would be proof against electrolysis and corrosion; but on account of the liability of the cement to break away from the pipe or crack, I believe it best to first surround the pipe with a box, then fill around the box with cement."

Upon the second question, Mr. J. M. Humiston writes: "Any chemically inert substance which is substantially a non-conductor of electricity, when applied to the pipe in such a manner as to absolutely insulate moisture from the metallic surface, would be more efficient than a Portland cement concrete. One fairly effective method of doing this is to surround the pipe with a coating of tar concrete; the tar and the gravel, sand, or stone to be thoroughly dried, and perfectly applied hot and the pipe to be laid in a wooden trough containing the mixture." Mr. R. Watt advocates: "A coating of about ⅛ inch thick of either California, Trinidad, Gilsonite, or Bermudez asphaltum, combined with petroleum residuum and sulphur, prepared in the following manner: The petroleum residuum is to be heated to 300° Fahr., 3 per cent. of common sulphur added to it, the same to be cooked to 300° Fahr. until the sulphur is thoroughly incorporated with it. Then sufficient of this mixture to be added to the melted asphaltum until the asphaltum is of such consistency that it will not become too soft or run at 120° Fahr., or crack when struck with a hammer at a freezing temperature. The pipes should be dipped in this composition at a temperature of about 225° Fahr. In being laid, if the composition should in any way be removed or damaged, sufficient should be put on with a brush, hot, after the pipes are connected. This composition makes a perfect insulation and proof against electrolysis." Mr. W. A. Baehr states: "Pitch is probably a better pipe covering than cement; and the experience with pitch seems to be very favourable in several cities—notably Grand Rapids and Milwaukee. It has been used in these two cities mostly on services. A St. Louis firm have recently marketed a substance called 'Perannite,' which consists largely of sand and sulphur. This substance has a high electric resistance, and at first we thought it would make a good pipe covering. Later experience with it has determined that the substance as put on the market is too brittle. The slightest tap on it with any hard substance is apt to break the 'Perannite' off the entire length of pipe into small pieces. The Laclede Gaslight Company are about to install a Pintsch distribution system of some 40 or 50 miles of steel pipe; and a part of this will be laid in plain concrete and another portion in pitch. The result of that construction will be very interesting from the standpoint of pipe covering, as there are unusually heavy electric return currents in our piping; and we have exceedingly difficult conditions to meet as concerns character of ground. We will distribute Pintsch gas at a pressure of from 200 to 250 lbs. per square inch." Mr. W. A. Aldrich asserts: "Boiled tar is as good as cement for protective purposes at very much less cost. Make a trough a little larger than the size of the pipe to be laid; boil the tar to a consistency nearly of pitch; fill the trough with the mixture. It is an absolute preventive of electrolysis." Mr. J. D. von Maur remarks: "We have used pitch and a new substance called 'Perannite,' which is manufactured in St. Louis. I believe that a pipe laid in a V-shaped wooden trough and surrounded with pitch is well protected both from electrolysis and corrosion. The objections are, of course, the first cost, and, in our case, the necessity of excavating in order to apply the pitch. Regarding 'Perannite,' I can only say at this time we have installed a large number of services covered with this material; but as none of these services are over eight months old, it is too early to arrive at a definite conclusion as to its worth as a protective covering. Our main objection is that it is rather too brittle to stand ordinary rough usage. We will know better next year what we think of this material."

Annual Meetings of the French and Italian Gas Societies.—Notices have just been received by members of the above Societies announcing the dates and general programmes of this year's meetings. The Société Technique du Gaz en France will meet on Tuesday, June 14, in the hall of the French Institution of Civil Engineers. On the morning of that day, the usual reports will be taken; while in the afternoon, the proceedings will be opened with the address of the President (M. Deleury). The technical papers will then be read, and continued during the following day, in the evening of which the annual dinner will be held. Thursday, the 16th, will be devoted to visits to various works. The meeting-place this year of the Italian Gas Society is Rome, where the sittings will commence on Tuesday, the 24th inst. There will be informal discussions on the subject of the municipalization of gas undertakings in Italy, on the question of workmen's insurance, and generally on the relation of employers to their employees. The meetings will be held in the offices of the Anglo-Romano Gas Company, who have invited the members to an excursion to Tivoli.

WELSBACH AND KERN COOKING STOVES AND APPLIANCES.

THE Welsbach Incandescent Gas-Light Company have entered into a new field of enterprise; and the Welsbach-Kern burner is, as it were, the bridge that has carried them over into it. The departure, indeed, is one which may have an important influence on the future of the Company, particularly if the excellence of the samples of the new work which they have brought to notice represents the rule up to which they are going to produce their new lines of goods—without saying anything about surpassing it, if possible—in the future. To be brief, not only will the Company from now be able to supply anything that is required for incandescent lighting both for indoor and outdoor purposes, but they are also prepared to furnish, even from the outset, a good range of apparatus for kitchen use extending from a cooking-stove down to small boiling-rings, and designs are well advanced for manufacturing cooking-ranges on a still larger scale. For the past few years, as has been well known, there has been on the market the Welsbach-Kern radiator (the latest types of which have been most successful both practically and commercially); and the application in this radiator of the principle of the Kern burner gave birth to the idea of extending the principle, as far as possible, to cooking appliances. One suggestion led on to another, until the Company have seen their way clear to embark completely into this department, applying their extensive knowledge of the construction of the bunsen burner for lighting to the manufacture of burners—giving (through as near perfect combustion as can be of the gas and air mixture) a high heating value for a moderate consumption of gas—for cooking-stoves of various kinds.



THE NEW WELSBACH COOKING-RANGE.

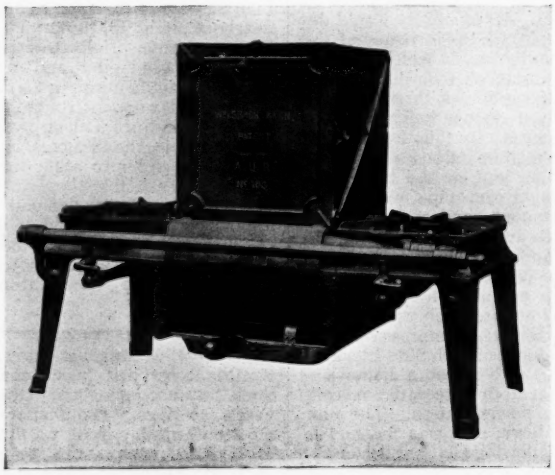
If asked to name the points off-hand that specially struck us on inspecting these stoves and appliances, the reply would unhesitatingly be the clean finish of the castings, the application of the Kern principle to the burners on the hot-plates and boiling-rings (which give highly intense flames), the novelty of the shape of those flames, the novelty found too in the general construction of the appliances, the evident studious regard that has been paid to convenience and facility in use and for cleaning, and the excellent workmanship. These are obvious features, but as to the efficiency, we have, of course, to rely upon the testimony of those who have put the new goods to practical test.

This summing up of the meritorious points will relieve us of the necessity of repeating them in generally and briefly describing the stoves which the Company have already made. There is first the cooking-range; and in its construction the Company have taken into their counsel a certified cookery teacher, and have adopted her practical suggestions. Patterns are now ready for constructing several sizes of the stove, from one suitable for prepayment consumers up to one for service in a large establishment. The range seen has an oven with a height inside of 23 inches, a width of 12⅝ inches, and a depth of 12 inches; the oven being heated by 34 jets. It is jacketed with slag wool, and is enamelled both inside and on the top-plate. The sliding shelves are all fitted with lugs at the rear, so that, on drawing them out, they are firmly supported in position without any chance of accident. On the top is a reversible griller (of a pattern that is suitable for chops and steaks), and two boiling-burners, which are easily fitted by a half-lock bayonet joint, and so are readily removed for cleaning purposes. There is a good space between the top of the oven and the hot-plate, which measures 21 in. by 17½ in., and is hinged at back. The bars are all removable, but they are locked in position by steel spring clips. In a test made with this range, the following are the recorded results: The oven was started at 10.50. By eleven o'clock 380° Fahr. was registered. The dinner cooked consisted of 6 lbs. of beef, 1 lb. of sausages, a fowl, 6 lbs. of potatoes. 3 lbs. of cabbage, an apple tart, and a custard. Cooking was finished at 12.30; the consumption of gas having been 56 cubic feet, at a pressure of 15-10ths.

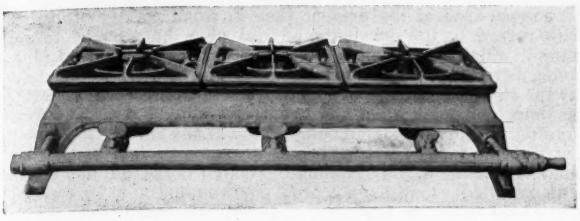
A compact griller next claims attention. The workmanship, as in the other lines, is good. The door swings downwards, being kept in position when closed by lugs on the door and grooves on the side of the casing of the griller. The sliding trays are formed so that a detached handle can be used for lifting them out safely without burning the hands. The grill at the top is in the form of a grating; and it is opened or closed for boiling or grilling as the case may be by a simple sliding device at the side. The top is arranged for carrying a portable oven of a height of 11 inches, a width of 11⅛ inches, and a depth of 9⅛ inches. It was observed that when alight there was no smell from the griller; and the remark applies equally to all the other apparatus.

Various types of boiling-burners are also made to suit requirements and special purposes. But the better class have special features. They are fitted with burners having a good-sized mixing chamber, oval in shape, and divided horizontally by a gauze of the type used for the inner cone of a Kern burner. By this, it is claimed that perfect combustion is ensured; and the characteristics of the flame are pointed out in proof. Tests for lighting-back ended in failure to obtain that undesirable condition. In designing these boiling-rings, a departure has been made from the old-fashioned form of casing. The consumption of gas varies, according to the sizes, from 4⅛ to 10 cubic feet. A series of cheaper, and yet economical and strongly made, boiling-rings were also brought to notice. In these, the burners are not on the Kern principle, but are constructed in two parts; the removable part being in the form of a cup, and so made that nothing—say, through boiling over—can get into the burners to prevent the egress of the combustible mixture. An ironing-stove, and one for laboratory use, are fitted with Welsbach-Kern burners similar to those described for the better class boiling-rings.

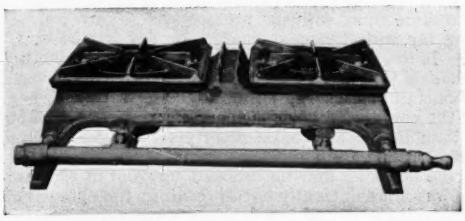
A series of hot-plates have certain distinctive features, which are sure to please. A most useful combination (shown in the second illustration) is found in the Welsbach-Kern boiler, griller, and cooker, which has large opportunities for attaining popularity. It is in the form of a hot-plate, with a downward extension in the centre forming a grilling chamber, and with provision at the top for taking a portable oven; so that boiling, simmering, baking, and grilling can go on simultaneously with this small piece of apparatus. At each end there is a Kern boiling-burner, one of which is of star-shape for simmering. The griller is in the centre; the burner consisting of five iron tubes, each throwing ten small, but in the bulk powerful, jets. The grilling chamber underneath is provided with supporting bars on either side, so that the tray can be placed in five different positions. The tray is, further, arranged with a swing door so as to retain the heat. The portable oven above is similar to the one already described in connection with the ordinary form of griller. Observation was next made of hot-plates in three sizes. The largest size has a boiling-burner at each end and a reversible grill in the centre, with a raised platform. The hot-plate is 24 in. by 10 in.; and the outside dimensions are: Height 7⅛ in., length 26 in., and width 15½ in. The second size is a three-burner hot-plate, each burner being of varying power—full on, the kettle burner consumes 10 feet of gas an hour, the centre one



A WELSBACH-KERN COMBINATION—BOILER, GRILLER, AND COOKER.



WELSBACH-KERN HOT-PLATE—THREE BURNERS OF VARYING POWER.



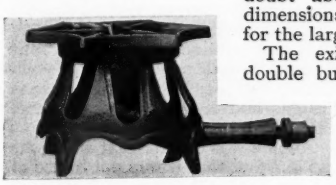
DOUBLE-BURNER (KERN) HOT-PLATE.

7 feet, and a star simmering-burner 5 feet. The centre burner throws a powerful single jet of bulbous form, and the kettle burner one of tulip shape. The flames alone are quite out of the common in form; and they have other interesting features for the gas man. There is no

A WELSBACH-KERN BOILING-STOVE.

doubt about their intensity. The dimensions are similar to those given for the larger size.

The existing series ends with a double burner hot-plate, also fitted with Kern burners. In this case the top-plate measures 19 in. by 9⅓ in., while the outside dimensions are: Height 6 in., width 15½ in. and length 20½ in.



A BOILING-RING WITH WELSBACH-KERN BURNER.

This is a general description of the new types of stoves and other appliances at present produced. But their range will be quickly extended. It is plain that, in entering this new branch of business, the Welsbach Company are determined to gain a reputation for good work and performance. It is recognized by them that they are confronted by a difficult task to compete with the old-established firms in this line; but they are determined to make a bold bid for success in their new venture.

AN IRONING-STOVE SHOWING WELSBACH KERN MIXING CHAMBER.

Two large pumping-engines are in course of construction for the city of Wellsvile (Ohio). They are of the cross compound vertical Corliss condensing type. Each pump will have a capacity of 3 million gallons per 24 hours when pumping against a pressure of 145 lbs. per square inch, with a steam supply at a pressure of 160 lbs. per square inch. A duty of 100 million foot-pounds for every 1000 lbs. of steam used is guaranteed for each engine.

At a meeting last Thursday of the Newcastle-on-Tyne Association of Students in connection with the Institution of Civil Engineers, Mr. W. Doig Gibb (one of the Vice-Presidents) read a paper on "The Construction of a Modern Gasholder," in the course of which he described the holder some time ago erected by the Newcastle and Gateshead Gas Company at St. Anthony's (see "JOURNAL" for July 2, 9, and 16, 1901). A hearty vote of thanks was accorded Mr. Gibb for his contribution.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

The Question-Box.

A Meeting of this Association was held last Friday at the Regent Street Polytechnic, for the purpose of considering questions which had been sent in to the Hon. Secretary (Mr. P. F. Scarth) for discussion in connection with the newly-instituted "Question-Box." The chair was taken by the Vice-President (Mr. R. H. Brown), in the absence of Mr. Walter Grafton.

The first question submitted—"What is the comparative value for lighting purposes of gas at 3s. per 1000 cubic feet and electricity at 6d. per unit, and how is the comparison made?"—was productive of a long discussion. Mr. Richmond thought that making a comparison of candle power was the best way. A unit of electricity would supply thirty 8-candle power (nominal) lamps for one hour, which was equal to 240 candles for 6d. Then taking gas burnt in an incandescent burner at 12 candles per cubic foot (which was a low estimate), 20 cubic feet would be required to give the same light, and would cost very nearly ¾d. In this way, therefore, gas was eight times as cheap as electricity; while used through a flat-flame burner, it was three times as cheap. Mr. Upton remarked that for an incandescent burner, 12 candles per foot was a little too low; a fair average light through the life of a mantle being 15 candles, which would represent 15,000 candles for 3s. As regarded electric glow lamps, the consumption of current was a very contentious point. The lamps were advertised to give a candle for 3½ watts; but whether or not this was attainable by the lamps when new, it was certain that they afterwards fell off until the consumption reached 4 watts per candle. It would therefore be fair to take the average right through at 3¾ watts per candle. In an electrical unit, they got 1000 watts, which, divided by 3¾, gave 267 candles per unit—that was, for 6d. To exactly compare the values, it was a good idea to bring them down to the amount of light obtained for 1d. Turning to gas, 15,000 candles for 3s. was equivalent to 417 candles for 1d.; while 267-candle power of electricity for 6d. equalled 44 candles for 1d. This showed gas to be nine times the cheaper of the two. As regarded flat-flame burners, the question of efficiency again came in; but giving the gas its full credit of (say) 3 candles per cubic foot—or 3000 candles for 3s.—this was equal to 84 cubic feet for 1d., as against the 44 candles of electricity. Even with old-fashioned flat-flame burners, therefore, the electric current was almost exactly twice as dear as gas. Mr. Clark said that, in any comparison of the two systems of lighting, illuminating power should be taken into consideration. There were also other minor points—such as the ventilating effect of gas—which should, of course, be thought of. To take only the candle power was rather misleading on both sides of the question. Mr. Upton said that this enlarged the ground of comparison very greatly. As regarded the question of illuminating power, it was all very well for the gas people to say: "We give 64 candles, and on that basis we make a very nice showing;" but at the same time, arguing from the point of illuminating effect, it must be remembered that four 16-candle power glow lamps would give a better result than one 64-candle incandescent burner. If the candle power was not well distributed, gas did not show up quite so well. Mr. Richmond maintained that they could display the light as well with gas as with electricity, because instead of one 64-candle lamp they could have four small inverted or "Gem" burners. Mr. Upton: Can you get from those four burners 64-candle power for a consumption of 3½ cubic feet? Mr. Richmond replied that they could get very close to it—for example, with the "Bijou" inverted burner.

The next question was: "What is the comparative value of gas-engines and electric motors, and what must gas be offered at to compete with current at 2d. per unit; special reference being made to small motors of about 2 to 5 horse power?" With regard to the first part of the question, Mr. Brown said he did not think there was much difference in the capital cost of the two appliances. Mr. Ainsworth remarked that when contending with electricity for power it was advisable to make the matter as simple as possible. If he were going to treat with a customer for a gas-engine, the first thing he would say would be: "The electricians claim that their motors consume from ¾ unit to 1 unit per horse power; gas-engines consume from 15 to 20 cubic feet." Of course, there were engines that required more gas; but he believed they were turning them out now for this consumption. This made electricity 2½ times dearer than gas. A great advantage of the gas-engine was that it was more to be depended upon than the electric motor. Mr. Richmond remarked that theoretically a unit of electricity produced 1⅓-horse power, which, at 2d. per unit, worked out at 1½d. Taking gas at 3s. per 1000 cubic feet, and 20 feet per horse power (which was rather high), this equalled between ½d. and ¾d. per horse power, or about half the price of electricity. One thing in favour of electric motors—especially for intermittent work—was the ease with which they were stopped and started; but then there was no reserve power behind them. Mr. Upton said that, of course, a unit was 1000 watts; and a horse power was expected to be obtained from 746 watts. It all depended, however, on efficiency; and a small motor might have only 80 per cent. efficiency. Taking this particular figure, a brake

horse-power would cost (say) 2d. On the other hand, with small gas-engines they could get a brake horse power for 25 cubic feet. Now 25 cubic feet equalled one-fortieth of 1000 cubic feet; and reckoning this at 2d. (the price of electricity per brake horse power), it was equal to gas at 6s. 8d. per 1000 cubic feet. There were, however, many points to be considered. For intermittent work, the electric motor had sometimes great advantages.

On the third question—"What is approximately the sulphur content of carburetted water gas, using (say) 2·5 gallons of oil per 1000 cubic feet; also does the use of benzol increase the sulphur to be removed, and if so to what extent?"—the first speaker was Mr. Chree, who said they might take it that the quantity of sulphuretted hydrogen was roughly 0·2 per cent., which was considered to come from the oil. The other sulphur compounds existed to the extent of from 4 to 7 grains per 100 cubic feet; but they originated chiefly from the coke, although there were certain classes of oil which affected them to some extent. Mr. Upton remarked that he could not find any figures that quite met the case. He had, however, come across one analysis, though, of course, no mention was made of what oil was used—which was a big point. This stated that the oil contained 0·03 per cent. of sulphur by weight; and reckoning the 2½ gallons of oil at 150,000 grains, this was equal to 45 grains of sulphur per 1000 cubic feet, *plus* the sulphur obtained from the coke. As regarded commercial benzol, he had turned up some figures; and from what he made out, the average seemed to be about 0·4 per cent. of sulphur. The question did not state the amount of benzol; but suppose it to be one-tenth of a gallon per 1000 cubic feet (equivalent to about 2 candles), a gallon contained 61,600 grains, and one-tenth of this would be 6160 grains per 1000 cubic feet, of which 0·4 per cent. was sulphur. Therefore it was a simple sum to arrive at 24 grains per 1000 cubic feet as the amount of sulphur introduced into the gas.

Question No. 4 was: "In a district served with gas at (say) 2·5 to 3 inches, is it advisable to place a governor immediately after the meter or to use one of the small governors just before the burner; is it necessary with these pressures to govern at all?" Mr. Chree remarked that it was generally admitted that the most economical way of burning gas was to govern it at the point where the light was. At the present day, there were so many sorts of burners, each requiring a different pressure. The incandescent "C" burner needed from 15-10ths to 20-10ths pressure; whereas in another part of the same house there might be an ordinary flat-flame burner requiring for the highest efficiency not more than 8-10ths. It was therefore certainly better to govern at the point of ignition. Mr. Clark thought that, with an increase in the pressure of the gas supply, by careful adjustment at the burner, they might get a very much higher efficiency; and therefore if the pressure was there, and fairly constant, they might take advantage of it. Mr. Upton said the ordinary incandescent burner did best with 2 inches pressure; and if the pressure was fairly constant at (say) from 2½ to 3 inches, it would be the easiest thing to adapt the burner to this condition. This led to the conclusion that the burners in each district wanted carefully looking after. Some day, perhaps, the gas companies would take this question in hand, and supply burners as cheaply as anyone else suitable to their particular gas supply. Mr. Ainsworth said that no doubt if they got gas companies to go to the expense of providing governors at every point, it would be all right; but this time had not yet arrived. Neither had the time come when they were able to get everyone to have a governor at the meter, which was the next best place to the burner. With a pressure of from 2½ to 3 inches it was possible to work fairly well with incandescent burners; but at the same time it had to be remembered that there were many different kinds of supplies. In his own district, if they had a governor on in many cases, and reduced the pressure to 1½ inches, they would find that it would not be sufficient for some parts of the house.

With reference to the next question—"What are the comparative values of wet and dry meters; does the use of the former entail any extra expense for watering, &c., and do the services suffer at all from condensed water being carried over?"—Mr. Richmond stated that wet meters were generally looked upon as being more accurate than dry. But, of course, they were more trouble, as the water-level had to be strictly maintained. Mr. Ainsworth said there was no doubt the wet meter was more accurate, and also that there was more expense connected with it. They were, however, now so made that they did not get much below the water-line; and besides this, dry meters required changing more often. Of course, the pipes must be arranged with a fall towards a wet meter, or else there would be trouble with jumping lights; and even with dry meters it was quite possible to get condensation—it depended upon how they were fixed. Considering the matter all round, there was much to be said in favour of the wet meter.

On the question: "In running services for cookers, is it necessary to use only iron barrel, and what are the objections to the use of lead or compo.?" Mr. Damzelman remarked that iron barrel was by far the best. With compo. or lead, they were always liable to leakage. With iron barrel, all that was necessary was, at the drops, to put a T, so as to draw the water out. All they had to do then was to take the plug out and empty the pipe. Mr. Chree said in his opinion lead and compo. should be used as little as possible in dwelling-houses. In the event of a fire, it easily melted, and was a source of great danger—particularly some of the compo. used at the present time in small cottage property. With regard to the durability of lead pipe, he referred to an example which had been quoted recently of a piece of lead pipe having been gnawed through by rats. He said he would defy any rat to gnaw through wrought iron. Mr. Ainsworth thought the time had come when gas companies should put their foot down on the employment of compo. pipe of any kind. Of course, it was easier to use; but there was always a certain amount of danger attending it. Mr. Hollington related a case that had come to his knowledge in which a compo. pipe running round a cottage ceiling was taken as a picture rail—with the result that might have been expected.

The seventh question was as follows: "According to the latest particulars of the recently introduced vertical system of retorts, the extra gas made appears to be derived from the carbonization of part of the tar. Is this so, and what then are the objections to doing the same thing with the present system of retorts—*i.e.*, introducing tar with the coal charge, or say at the end of the charge? Is there any information as to this being tried before?" Mr. Clark said it appeared to him that the extra make was due to the carbonization of part of the tar. The vapours when given off from the coal had to pass through a certain depth of hot coke—more than in the horizontal retort. The vapours given off in the vertical retort from the lower part of the charge would go through the hot coke and be cracked up; but at the same time the coke was not sufficiently hot to result in the extensive formation of naphthalene. If the vapours were subjected to longer contact with surfaces which were not quite so hot—as in the case of the coke in the vertical retort, where the amount of this surface must be enormous as compared with a horizontal retort—he thought the tar might be turned into permanent gas without the production of very much naphthalene. Mr. Chree said, with regard to the gas being subjected to longer contact with a heated surface at a somewhat lower temperature, that he believed this was tried in what was known as the Dinsmore process, through the use of which Mr. Isaac Carr claimed an increase of 10 per cent. in the quantity of gas. Mr. Clark's remarks seemed to bear out this theory. Mr. Clark pointed out that in the process referred to the vapours were passed through a pipe and another retort afterwards. Of course, tar was produced; it was not all used up. If a still closer contact could be secured with a not too hot surface, it would be better, though undoubtedly the hot pipe did something. Mr. Upton said that from what he gathered of the vertical retort system the gases did not have to pass through a large body of coke. The coal was fed in at the top of the retort a few pounds at a time, and fell down in a thin layer upon the coke produced by the former charges. Owing to the small amount of coal and the large amount of heated retort and spent charge underneath, the gas was rapidly given off and as rapidly taken away from the retort. Of course, it had a fairly long way to go, during which time a great proportion of the hydrocarbons were split up. The tar did seem to be split up, because the yield was smaller than with the ordinary system; but, for the reasons he had stated, he thought the gas had less distance to travel through the coke in the vertical than in the horizontal retort. As to the latter part of the question, he was certain that what was suggested had been tried; and the fact that it was not in use at the present time, would seem to show that there were difficulties with it. Mr. Warren remarked that one objection to putting tar in the retort with the coal was that it would spoil the coke, as the tar would produce a sort of scurf which would be mixed with it. Mr. Upton added that the vertical retort question was nothing new. The shale oil industry in Scotland had been working for a great number of years past with these vertical retorts, though certainly the conditions were somewhat different. Mr. Clark: I think Murdoch used one.

The query "Are there any advantages in the use of taper ascension-pipes over a pipe having a diameter equal to the size of the longer end of the taper?" was replied to by Mr. Brown, who said that ascension-pipes were originally tapered for the removal of the deposit inside. They were, however, now made 7 or 8 inches in diameter, which was different from when they were 4 or 5 inches; and very many were absolutely straight from end to end.

In answer to the question "What is the rule for ascertaining the diameter of ascension-pipes?" Mr. Richmond said he never knew of one. For about eight retorts in a setting, they did not want a pipe of less than 7 inches diameter; and they should never in any case have one under 5 inches.

The last subject considered was: "Is the gas yield greater with a dry main than when working with a seal, and what is the best depth of seal to work with?" Mr. Chree said the make was certainly more with a dry main. When working with a seal, at the commencement of the charge there was always some back-pressure in the retort. The gas could not get away fast enough; and engineers who worked without a seal attributed their increased makes to this fact. As to illuminating power, with many classes of coal it was difficult to make a 16-candle gas unless working with a seal, because one was apt to draw in furnace gases; and to some extent the seal counteracted this. Mr. Clark: With a dry main, you have a better chance of maintaining a uniform pressure in the retort. Mr. Chree said the real point was pressure, which if too great directly after charging caused leakage from the retorts. Mr. Brown: With regard to pressure, an inch is a general thing.

OHIO GASLIGHT ASSOCIATION.

Annual Meeting at Cleveland.

The Twentieth Annual Meeting of the Association was held at Cleveland, Ohio, under the guidance of the President, Mr. John D. M'Ilhenny, of Philadelphia. Mr. Malcolm S. Greenough, the President of the Cleveland Gaslight and Coke Company, welcomed the Association in characteristically felicitous terms. The routine business included the election of 108 new active members, which the President claimed to be the largest accession ever recorded by any Gas Association, and for which he considered the credit was mainly due to the Secretary and to Mr. H. L. Doherty. The Secretary and Treasurer reported a membership previous to the meeting of 9 honorary and 241 active members, that the receipts for the year were £204 and the expenditure £160, and that there was a balance of £142 in hand.

The President gave a very short Inaugural Address, in which he alluded to the good work being done by the Association, and eulogized the members of Committees who unselfishly devoted time and talent to its service. He suggested, as a further advance, the establishment of a Bureau of Information for the use of the members. As regarded the gas business, he could report steady progress. Outputs continued to increase; and in one case the goal of 10,000 cubic feet per head per annum had already been passed. He especially referred to the sale of gas for industrial purposes as an advantageous line of business.

High-Pressure Public Lighting.

Mr. J. J. Knight, of Kalamazoo (Mich.), read a paper on "High-Pressure Gas Lighting," by means of which he claimed that it was possible to light public thoroughfares far more effectively, and certainly at no greater cost, than can be done with electric arc lamps. He recommended a distinct distribution system of wrought-iron pipe, radiating from a central station (where the gas would be put under high pressure), mostly laid under the footwalks, and lamps 100 yards apart on either side of the road. On an ordinary street 22 yards wide, the light would be about 12 feet above ground level; and there would be three mantles in each lamp. The lights would be all controlled from the station. The distributing pipes would carry gas enough to supply pilot lights at ordinary pressures, so that putting on the high pressure would mean lighting up, and shutting it off would put the lights out. One central station would be sufficient for a district of 25,000 to 30,000 inhabitants. Such a system could be operated on a moonlight schedule, and need not be in use a minute longer than required.

Mr. Schwarm inquired whether the author included the latest forms of enclosed arc lights in his remarks. Mr. Warmington asked what pressure was contemplated at the burners. The President understood that high-pressure gas lighting was giving satisfaction in England. Mr. Doherty thought the author was working on a most promising line. Mr. Stone considered that independent control of the public lights from one point was a very important advantage. No doubt the necessity for lighting each lamp was a drawback to the use of gas where electricity could be had. In his mind, the financial part of the scheme would require careful figuring, even on a ten or a fifteen year contract. There was no doubt that the consumption of mantles would be greater at high than at ordinary pressures; and he questioned whether, on the whole, the cost of maintenance, &c., would not more than offset the increased efficiency. The author considered that his system would compete with open, enclosed, or any form of electric light. He did not require more than 5 or 6 inches pressure at the burner; but, of course, that on the line would be higher.

Oxide Purification.

A paper on "Economy in Oxide Purification," by Mr. H. L. Rice, of Norfolk (Va.), was read by Mr. Schwarm, in the absence of the author. Attention was directed to results obtained at Norfolk, and to such light as they might throw on the general questions of proper proportionate area, construction, and working of oxide purifiers. A new set of two 16 ft. by 20 ft. by 7 ft. deep boxes, the flow divided up and down through two 3-feet layers of Connelly iron sponge, was put into operation on Jan. 1, 1902. They were used for water gas which was thoroughly condensed and freed from oil or tar before reaching the purifier inlet. The set was rated as equal to 800,000 cubic feet per day, not estimating the divided flow as quite equal to double area one way; and it had been worked at less than half capacity—viz., from 15,000 cubic feet per hour in winter to 10,000 cubic feet in summer. The top outlet was provided with a wooden slide, to regulate the division of the gas. The order of working was changed regularly once a week—the second or clean box being put first; and the contents were not changed until the last box on the series would not become clean after reversing. No air was used in 1902; but in 1903 about $\frac{1}{2}$ per cent. was injected at the exhauster. Three batches of 1500 bushels of new oxide were provided at the start. In 1902, there were only four changes—viz., in March, May, September, and December respectively. After December, 1902, there was no change until November, 1903; and on Feb. 1 last the boxes were still doing well. The material taken out of box B last November had passed 88 million cubic feet. At starting the first box showed foul in a week, and the alternative of reversing the flow of gas would have been emptying or revivifying; but reversing without air enabled the boxes to be run as above. In the coal gas department he had four shallow boxes, each 14 feet square, with centre-valve, and each charged with a 2-feet layer of Connelly iron sponge. On Jan. 1, 1903, the system of weekly changes was adopted by pushing the centre-valve one box ahead each week; all boxes being kept full and covers down. During the year, 52 million cubic feet were passed through this set—the maximum being 240,000 cubic feet a day; and in no case did the second box show foul. Several changes had to be made on account of back-pressure and other causes; and no air was used. He credited Mr. Byron Chollar with the first scientific employment of the theory that revivification does not go on actively in the presence of sulphuretted hydrogen. His experiments supported this, and showed that revivification went on mainly in the second box. In the ordinary method of working, the air was driven farther and farther from the point where it was needed, and finally escaped with the purified gas; but by the reversing system the air or oxygen was effectively employed. Purified gas, unaided by oxygen, evidently had a limited revivifying power, as shown by his experience in 1902; but the use of air in 1903 proved much more effective. By a careful application of known results, he believed it would be possible to purify 100,000 cubic feet of gas per bushel of oxide. Each reversal was subject to the objection that slight traces of sulphur were observable in the gas for a short time. He advocated large area, moderate depth of material, and the introduction of oxygen for revivification at the inlet of the second box.

Mr. Harrop opened the discussion by observing that the most important point in oxide purification was the question of whether revivification took place in the presence of sulphuretted hydrogen. This would govern the practical advantage of reversing. One advantage was that the free sulphur in the second or third box absorbed an appreciable quantity of carbon disulphide. Mr. Osborne remarked that in small works, having an output of less than 20 millions per annum, the cost of ordinary oxide purification did not exceed £20 a year, and might be less, so there was no inducement to go in for reversing; but, of course, this did not apply to larger gas-works. Mr. Greenough remarked that even in large works the cost was so low that many did not trouble much about further reducing it. Mr. Butterworth said that a small saving was not to be considered against absolute security as regarded pure gas. Many companies, he observed, dispensed entirely with buildings; thus saving a considerable outlay. The interest on cost and depreciation of buildings came to two-thirds the cost of purification. Mr. Schwarm took it that the writer not only aimed at cheaper, but also at more efficient purification. Mr. Hayward noted that the author thoroughly condensed and washed the gas before it reached the purifiers. This was a very important point that might well be emphasized. He advocated a small blower attached to the exhauster, which not only reduced the cost of changing purifiers, but also the trouble and risk of nuisance. Mr. Stone thought that many of the purification troubles at small works were really due to either inefficient washing or condensing. Changing purifiers was dirty and disagreeable work; and any reduction in this direction went a great deal farther than a mere saving of cost.

A Comparison of Gas Outputs.

The next item on the programme was a paper prepared by Mr. J. T. Westcott, entitled "Why English Gas Outputs are Larger, with Lessons to be Drawn in the United States." The principal portions of this paper, with an abstract of the discussion, are given below.

A COMPARISON OF GAS OUTPUTS.

Mr. Westcott on "The Wealth of Nations."

At the suggestion of the President of the Ohio Gas Association (Mr. J. D. M'Ilhenny, of Philadelphia), a paper, dealing with the reason for the output of gas in English works being large in comparison with those in the United States, was prepared for the recent meeting of the Association by Mr. J. T. Westcott, the Manager of the Economical Gas Apparatus Company, Limited, and read for him by Mr. E. M. Osborne, of Valparaiso. An interesting feature of the paper was a compilation, by the author's Assistant (Mr. Ralph Carr, jun.), of a number of statistics of representative towns in different countries, arranged in the order of greatest consumption, and converted to American standards. In cases where a scale of rates is in existence, the net price only is given. We reproduce the tables, and give the principal portions of the paper and discussion.

Mr. Westcott began by laying down the proposition that "the *per capita* wealth of most countries is proportionate to the amount of gas consumed." He then went on to refer to the weather which usually prevails in London in winter—overcast skies varied by periods of fog—and pointed out that these conditions are responsible for a much greater number of lighting hours during the year than are required in the United States. In the summer, the temperature in England rarely registers more than 90° Fahr.; nor is it many degrees below freezing-point in winter. Occasionally, for a

few days, there are cold spells, in which from 4° to 10° of frost will be registered. This comparatively slight variation of temperature accounts for a different method of heating the buildings. Until recent years, this was accomplished by a great fire in each room, using bituminous coal. Now most houses are provided with gas heating-stoves fixed in the fireplace. The heating of a number of rooms in English houses by gas-stoves accounts for a larger fuel consumption than American conditions permit.

To assist the author in the preparation of his paper, Mr. S. Y. Shoubridge, the Engineer of the Crystal Palace District Gas Company, gave him the monthly output of gas from the Company's works during the year 1902; and, by way of comparison, similar particulars were furnished by Mr. S. R. Ogden, of Blackburn, for the financial year 1902-3. These are given below:—

Summer Output.

	Crystal Palace Gas Company Cubic Feet.		Blackburn Corporation. Cubic Feet.
April	98,414,000	..	37,866,000
May	91,908,000	..	31,194,000
June	78,388,000	..	26,361,000
July	78,299,000	..	27,088,000
August	82,396,000	..	29,568,000
September	94,988,000	..	38,661,000

Winter Output.

January	157,742,000	..	83,222,000
February	137,382,000	..	62,156,000
March	118,695,000	..	52,995,000
October	116,496,000	..	57,858,000
November	132,061,000	..	73,534,000
December	159,154,000	..	88,095,000

In a letter accompanying his figures, Mr. Shoubridge said he was not able to state exactly how much gas was used for fuel purposes; but the consumption during daylight hours amounted to 45 per cent. of the whole. He pointed out that there would, of course, be a considerable consumption of gas as fuel after daylight hours; and, on the other hand, a small consumption for lighting in dark places during daylight. After making allowance for these, he thought it would be safe to say that from 50 to 60 per cent. of the gas supplied by the Company is used for purposes other than lighting. In Mr. Ogden's letter, he said he could not give any reliable information in regard to the percentage of gas used as fuel, but he thought it would be roughly 50 per cent. in summer and 20 per cent. in winter.

The following figures relating to the two undertakings show the difference between the summer and winter consumption:—

	Crystal Palace Gas Company.		Blackburn Corporation.
Population of district	*	..	130,000
Annual make of gas	1,345,923,000 c. ft.	..	608,598,000 c. ft.
Consumption per head	[approx.] 7,500 ,,	..	4,681 ,,
Six months' output—			
Summer	524,393,000 ,,	..	190,738,000 ,,
Winter	821,530,000 ,,	..	417,860,000 ,,
Three months' output—			
Summer	239,083,000 ,,	..	83,017,000 ,,
Winter	454,278,000 ,,	..	233,473,000 ,,

* The area of supply embracing part of five districts, the correct population cannot be given.

Mr. Westcott went on to show that incandescent and high-power gas-lights are used for street illumination throughout this country in a much greater proportion than they are in America. There are also fewer electric lighting installations in use. Kerosene or lamp oil is retailed to the householder in America at about 12 c. per gallon; in this country at about 16 c.; and in Germany at about 20 c., including duty. The English consumer obtains almost twice as much gas for the same money as the American; so, from a purely commercial standpoint, the conditions are greatly in favour of the English people taking gas in preference to oil or electricity. Acts of Parliament mutually benefit producer and consumer; the capital expenditure and dividends thereon being regulated. The undertakings are protected against undue competition and blackmailing enterprises. This results in the consumer receiving his gas at the lowest rate consistent with conservative methods of business.

Mr. Westcott called attention to the fact, shown by the statistics, that the illuminating power of the gas supplied in England averages 17·39 candles, at 52 c. per 1000 cubic feet; whereas in America the average candle power is 22, and the average selling price 96c. He pointed out that with the present satisfactory state of incandescent mantles, the tendency in England is to still further reduce the illuminating power (not "low-grade" gas) and selling price. Different gas managers in England had, he said, shown that, so far as they were able to discern when sending

Comparison of Output from British, American, and German Gas-Works.

	Population of District.	Total No. of Consumers.	No. Using Slot Meters.	Annual Make in Cubic Feet.	Candle Power.	Price per 1000 Cub. Ft. s. d.	Price per 1000 Cub. Ft. Cents.	Yearly Consumption. Cubic Feet. Per Head.	Yearly Consumption. Cubic Feet. Per Consumer.
ENGLAND.									
London (South Metropolitan)	1,475,728	214,000	113,540	11,274,916,000	14·00	2 3	54	7,640	52,686
Liverpool	790,000	86,550	23,001	3,735,470,000	20·50	2 11	70	4,728	43,159
Birmingham	725,000	81,000	16,200	3,044,099,000	16·50	2 3	54	8,336	74,618
Manchester	720,000	133,089	35,818	4,735,300,000	19·00	2 6	60	6,577	35,580
Leeds	428,953	97,309	14,169	3,140,870,000	18·00	2 3	54	7,322	32,277
Sheffield	410,000	63,438	..	2,874,692,000	17·33	1 8	40	7,011	45,315
Newcastle	365,000	41,179	168	2,893,603,000	16·00	1 11½	47	7,927	70,268
Brentford	160,000*	44,298	20,971	1,925,145,000	16·50	2 11	70	12,032	43,459
Sunderland	150,000	16,882	..	966,165,000	15·50	1 6	36	6,441	57,230
Darwen	38,211	8,850	1,791	203,731,000	18·25	2 5¼	59	5,332	23,020
Widnes	35,000	6,176	3,836	244,520,000	19·75	1 1	26	6,986	39,592
Average	481,627	72,070	25,499†	3,458,046,455	17·39		52	7,303	47,019
SCOTLAND.									
Glasgow	950,000	20,564	328	6,121,367,000	20·75	2 6	60	6,443	29,634
Edinburgh	400,000	85,774	5,369	1,917,548,000	24·50	3 4	80	4,794	22,356
Dundee	160,871	40,704	3,974	611,452,000	20·00	3 10	92	3,800	15,022
Aberdeen	154,000	34,200	4,000	616,493,000	23·00	2 8	64	4,003	18,026
Paisley	80,000	19,559	925	380,848,000	26·33	2 6	60	4,760	19,471
Greenock	70,000	12,246	665	302,012,000	23·75	3 4	80	4,314	24,662
Perth	40,000	8,748	2,118	175,823,000	25·00	3 4	80	4,395	20,098
Average	264,981	58,256	2,483‡	1,446,506,143	23·33		73·71	4,644	21,324
UNITED STATES.									
Chicago (People's Company)	2,000,000	323,089	..	7,425,979,693	26·00	..	1·00	3,713	22,984
Brooklyn Union Co.	2,000,000	175,000	..	5,500,000,000	28·00	..	1·00	2,750	31,428
Philadelphia	1,500,000	190,407	..	5,885,000,000	23·00	..	1·00	3,923	30,907
Baltimore	550,000	57,889	..	1,847,436,000	20·00	..	1·00	3,359	31,913
Cincinnati	340,000	34,000	..	1,240,000,000	18·00	..	0·75	3,647	36,470
Cleveland	325,000	30,000	..	1,500,000,000	18·00	..	0·75	4,615	50,000
Pittsburg Consolidated Co.	320,000	19,293	..	636,691,000	22·00	..	1·00	1,989	33,001
New York Central Union	125,000	..	..	700,000,000	21·00	..	1·00	5,600	..
Northern Union	80,000	8,000	..	250,000,000	22·00	..	1·00	3,125	31,250
Average	804,444	104,710	..	2,776,122,966	22·00	..	0·96	3,636	33,494
GERMANY.									
Berlin	1,902,009	156,015	2,405	5,686,430,105	15·87	..	0·84	2,989	36,447
Dresden	410,000	33,563	..	1,154,454,122	15·20	..	0·88	2,815	34,396
Cologne	378,146	26,434	..	1,281,200,075	15·52	..	0·90	3,388	48,467
Leipzig	313,307	32,515	..	887,509,690	14·73	..	0·98	2,832	27,295
Darmstadt	73,000	7,240	44	144,515,527	18·48	..	1·01	1,980	19,960
Freiburg	61,000	5,575	16	146,801,570	15·07	..	1·14	2,406	26,332
Hildersheim	47,500	3,820	..	118,501,319	18·50	..	0·97	2,494	31,021
Average	459,995	37,800	352§	1,345,630,344	16·19	..	0·96	2,701	31,988

* Population has probably increased since this census was taken.
† Consumers using slot meters amount to 32·21 per cent.; Sheffield and Sunderland are omitted, as the number of slot meters is not given.
‡ Consumers using slot meters amount to 4·26 per cent.
§ Consumers using slot meters, 0·93 per cent., including the average of the seven towns in the table. We understand four had no slot meters in use.

out gas of low-candle power, they never had complaints from their consumers, and no one seemed to be aware of the reduction except themselves. From his personal contact with English engineers, he was of opinion that a very large majority of them were in favour of supplying this gas. This English "state of the art" might account for the unwarranted attack on certain British gas engineers at the last meeting of the American Gaslight Association.* But he thought Mr. A. C. Humphreys might possess his soul in peace. "Bluff" and Rankine's unrecorded arguments were not going to influence legislation. The advocates of high illuminating power in England had been confined almost entirely to certain persons interested in the manufacture of carburetted water-gas plants and their friends. He believed, however, that for both producer and consumer, the present English conditions favoured gas of low-candle power, supplied at a low price, with such calorific value as could be obtained from ordinary gas coal or a mixture of carburetted water gas and coal gas of equivalent thermal value.

Mr. Westcott then proceeded to make a few suggestions arising out of the statistics presented; his remarks being as follows: Do you not think the present conditions in America are favourable for carefully considering the reducing of both the illuminating power and the price of gas, whereby the consumer could obtain more energy for less money, and the gas undertakings a larger revenue from the sale of a greater amount of gas? While higher wages are paid for labour in America, the quality is better than in England, and fewer men are required, resulting in the cost of the gas in the holder being practically the same in both countries. With this premise, could we not increase our consumption by reducing the price of our gas, and yet still be able to pay our present dividends, unless there is too much watered stock? Why not make a special effort to increase the number of gas-engines in use? Also, to replace the present electrical street lighting with up-to-date high-pressure incandescent gas-fixtures, by making, if necessary, special concessions for the wholesale amount of gas that would be consumed? It would seem that a large number of slot meters could be fixed in certain households where at present the ordinary meter could not be trusted to be installed. English large outputs are traceable to conditions unknown to America; and manifestly comparatively few lessons can be drawn.

In inviting remarks upon the paper, the President said he thought some portions of it would constitute a very excellent text-book, where companies were applying for opposing franchises. He was referring particularly to the paragraph in which the author said: "The undertakings are protected against undue competition and blackmailing enterprises. This results in the consumer receiving the gas at the lowest rate consistent with conservative methods of business." Mr. Osborne asked for information on the relation of the candle power to the heating value of gas. He thought there must be a point where they would have to stop reducing the illuminating power, or the heating value of the gas would be affected. Mr. Doherty, who was asked by the President if he could reply to Mr. Osborne, said the light-giving constituents of gas had the highest calorific value, and as soon as one commenced reducing them, the heating value of the gas diminished. This, however, went down slowly, while the lighting power of the gas dropped rapidly as some of the illuminants were taken out or were not put in. The depreciation from a 22-candle to a 14-candle gas, for instance, might be a drop of only 9 or 10 per cent. in calorific value, and possibly less; while the reduction in candle power would be more—say, about 34 per cent. In gas-engine work, they did not know what went on inside the cylinder of the engine. There was a very interesting paper on this subject read by Professor White at the last meeting of the American Gaslight Association, which, he thought, might be studied with advantage.† The ideal gas for an engine would not necessarily be coal gas. In fact, he was inclined to think the commercial efficiency of a gas-engine working on gas having a large percentage of illuminants would be less per unit than it would if the gas were less rich. Many of the illuminants had a low ignition temperature. The compression in a gas-engine was limited to the point where prematuring occurred; and the gas that would be most suitable for engine work would be one free from hydrocarbons having a low ignition point, and also free from a large bulk of hydrogen, because an excess of carbon also caused premature ignition. Mr. Doherty went on to refer to another matter which he thought might interest some members if they have ever thought about the subject, and that was that when people speak of gas having a calorific value of (say) 650 B.T.U., this did not mean very much. That was the gross calorific value of the gas. Ordinary artificial gas would have from 10 to 11½ per cent. of its total calorific value tied up in the compounds, from which it would be given off only at 212° and below; and therefore, with gases rich in hydrogen, they could not figure on their gross calorific value, but would have to make allowance for the latent heat of the aqueous vapour contained in the combustion products, which also greatly influenced the flame temperature, because of the heat vaporization and the specific heat of the water, and also because this heat was probably not constant, but became much greater at higher ranges of temperature than it did with either carbonic acid gas or nitrogen.

At the close of Mr. Doherty's remarks, the President directed the attention of the meeting to the main subject of the paper, and pointed out that an interesting feature in the tables was the difference in the output of gas per head in English towns. For instance, at Brentford it was 12,032 cubic feet; while in another town (Liverpool) it was down to 4728 cubic feet. In the South Metropolitan Company's district, there was an output of 7640 cubic feet per head; and in Birmingham—a manufacturing town—it was 8336 cubic feet. Mr. Hayward called the President's attention to the explanatory foot-note relating to the Brentford figures. He said that the quantity of gas per consumer was only 43,459 cubic feet; while in the town given above it (Newcastle), it ran up to about 70,000 cubic feet. It was also interesting to note that the town selling the cheapest gas (Widnes) sold to only 6176 consumers, and showed an output of 6986 cubic feet per head, and an average of 39,500 cubic feet per consumer. So that it evidently was not a question of price or large consumption. Mr. Knight took exception to a statement made by the author at the outset of the paper, that "the *per capita* wealth of most countries is proportionate to the amount of gas consumed." He said he did not see why it followed necessarily that the individual wealth of most countries was proportionate to the gas consumption. In the cities he was familiar with, the quantity of gas consumed per head depended largely on the work done to get the business. It also seemed to him that the tables showed a very low consumption indeed compared with the United States. He was sure the average output of gas in the State of Michigan was greater than the figures showed. He thought it would be most unfortunate to have the statement go forth that they bought twice as much gas for the same money in England as in America; and he considered that somebody ought to write a paper on this subject next year from a different standpoint.

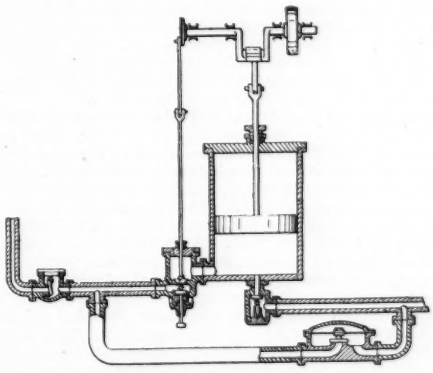
* See "JOURNAL," Vol. LXXXIV., p. 219. † *Ibid.*, Vol. LXXXIV., p. 620.

REGISTER OF PATENTS.

Producing a Mixture of Gases, or of Gas and Air, for Illuminating Purposes.—Lake, H. H.; a communication from the Selas Gesellschaft m.b.H., of Berlin. No. 5088; March 4, 1903.

This invention has reference to the apparatus described in patent No. 16,055 of 1901—by which a mixture of gas and air for illuminating purposes is produced by means of suction and forcing appliances, so worked that the gas and air are sucked in separately in a predetermined ratio through admission devices (dependent upon the operation of the suction and forcing apparatus) and then forced into the common pressure or service-main. This arrangement, however, it is said, presents the defect that no provision is made for an intimate mixture of the air and gas, either in the suction and forcing chamber or during admission to it; this intimate mixture being impeded whether several inlet passages are provided, situated at a distance one from the other, or if the suction of gas and air is effected in succession.

In accordance with the present invention, however, the two admission devices for gas and air respectively—which are dependent upon the operation of the suction and forcing appliances—are arranged (as shown) behind the admission aperture common to them both, in such a manner that, during the admission to the suction-chamber, the gas and air mutually penetrate each other. By this means, the gas sucked in exerts to a certain extent an injector-like action upon the air—that is to say, the air is sucked in not directly owing to the direct action of the suction appliance, but by the gas which is sucked in. Preferably the gas is sucked through the air in a number of jets.



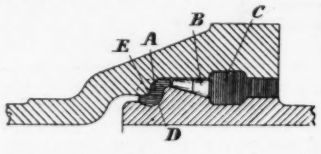
A further advantage presented by this arrangement is that a common actuating rod may be employed; and still another advantage consists in the fact that a specially favourable arrangement of the circulation conduit usual in suction and forcing apparatus of this kind is rendered possible. Owing to the close juxtaposition of the two admission apertures (which may advantageously be arranged directly one behind the other), the operation of the air-mixing device is rendered more efficient by reason of the fact that a circulation conduit, for maintaining a fixed pressure with a continuously acting suction and forcing apparatus, need only be provided with a single obturating member for both admission devices. Then, if the predetermined pressure is exceeded in the service-pipe, both admission devices will be rendered inoperative by this one special obturating member, without its being in any way

impeded in its further operation dependent upon the uninterrupted working of the suction and forcing apparatus.

In order to ensure efficient working, it is essential that when the suction process is interrupted both the admission apertures shall certainly be obturated. Additional advantages in the construction of the device as a whole, and in its certainty of action, are secured by this novel arrangement of valves.

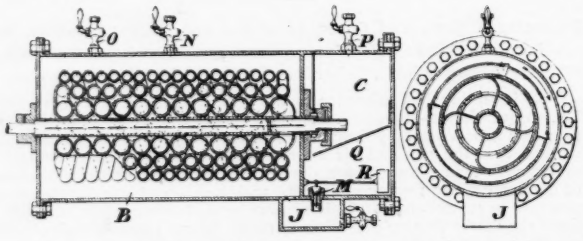
Pipe Joint.—Gilbert, J. P., of Toule, France. No. 6835; March 24, 1903.

This joint for spigot and socket pipes consists of a packing ring in combination with a run-in key of lead. To form the joint, after having inserted the spigot end of the pipe fitted with its vulcanized rubber ring A in the socket end of the other pipe, perfect compression is ensured while the joint is being made. The space B is filled with tarred tow or hemp, compacted by a chisel. It then only remains to run in molten lead so as to form the key C, and to fill all the space between the two walls of the pipes. The filling of tow or hemp has for its object to prevent injury to the rubber when the lead is run in. The joint is perfectly tight, owing to the compression exerted upon the rubber ring by two corresponding shoulders D E cast with the pipes—one on the spigot and the other on the socket end. This compression is produced, and maintained when the pipes are laid, by means of a lever disposed at the opposite end of the pipe to be joined, or by a bracing or binding arrangement adjusted on the two pipes to be connected.



Purification of Gas.—Jas, F., of Paris. No. 13,222; June 12, 1903.

This invention relates to a device which (in the words of the patentee) may be arranged at any convenient point of a coal-gas main—for example, after the meter of a supply branch—and which "produces an energetic mixing of the gas with water, removing all impurities which the gas may still contain, and which also imparts to the gas a pressure greater than that which it previously had."



The apparatus consists broadly of a cylinder closed at its extremities and divided into two unequal compartments B C. The compartment B (the larger of the two) is traversed by a longitudinal shaft capable of rotation, and around which are wound four coils, the convolutions of which are arranged side by side in three superposed rows. At the left-hand extremity of the apparatus, the coils open into the compartment B; and their apertures are diametrically opposite. Assuming that the chamber contains water up to a certain level, it is obvious that the apertures alternately come into contact, owing to their rotation, with the shaft, with the water, or with the gas above it, which gas enters the apparatus at O. Each coil therefore takes up alternately a certain quantity of water and a certain quantity of gas. These fluid and liquid beads or sections will pass through the coils—first of all in the outer row from left to right, owing to the inclination of the convolutions, then from right to left in the intermediate row, the convolutions of which are inclined in the inverse direction, and finally in the central row, from left to right again. The fluid and liquid beads or sections, the pressure of which increases in proportion as they progress through the apparatus, finally pass into the hollow portion of the shaft communicating with the compartment C.

The compartments B and C may be caused to communicate with each other at certain times by the intermediary of a chamber J, arranged beneath the cylinder and two holes formed in the cylinder wall. Of these holes, one is obturated by a valve M, while the other is free.

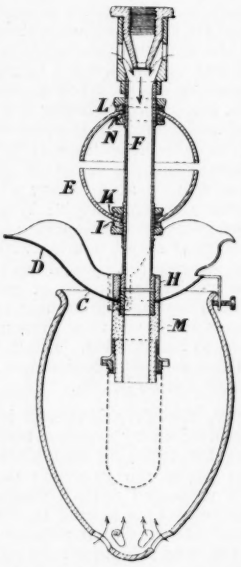
In order to start the apparatus, water is introduced into the compartment B through the cock N. When the water reaches the centre level, this cock is closed, and the cock O, for the introduction of gas coming from the meter, is opened. "The phenomena described above are produced, and the purification of the gas is perfect, owing to the extremely vigorous mixing, and the gradually increasing pressure, of the gas and liquid."

From the compartment C, the completely purified gas proceeds to the utilization appliances through the conduit P. The water charged with the impurities falls upon an inclined plane Q, from which it flows to the bottom of the compartment. When this water reaches a certain level, it lifts a float R, and so opens the valve M. The water, under the influence of the pressure existing in C, passes into the chamber J, from which it returns to the compartment B.

Charging Internal Combustion Engines.—Lindemann, O. (a communication from Körting Bros., of Hanover). No. 4137; Feb. 18, 1904.

When the pistons of the gas and air pumps used to charge an internal combustion engine are driven from the same crank-shaft and arrive at their dead-points simultaneously, they move always in the same relation to each other, it is pointed out by the patentees—that is to say, at each instant the proportion between the quantities theoretically pumped by the two pumps remains the same. If, for example, the two pistons are arranged tandem-wise on the same piston-rod, the stroke of the two pumps is the same, and the ratio between the quantities theoretically pumped is the same as the ratio of the areas of the pistons. For instance, if the mixture of air and gas delivered by the two pumps is to have the ratio 1 to 1, the areas of the pistons must be equal. When the combustible gas varies considerably in calorific value, it is, they say, advantageous to be able to vary the ratio of gas to air in order to retain that most favourable for combustion. As the area of the pistons cannot be varied without reconstructing the pumps, the stroke of the pumps, or of one of them, must be varied; and the present invention relates to a method of varying the ratio of combustible gas to air in the mixture delivered by the charging pumps, by varying the stroke of one pump, or the strokes of both pumps, without reconstructing the machine, or, indeed, interrupting the working of it.

Inverted Incandescent Gas-Burners.—Haddan, H. J., a communication from the Actien-gesellschaft, formerly C. H. Stobwasser and Co., of Berlin. No. 27,524; Dec. 15, 1903.

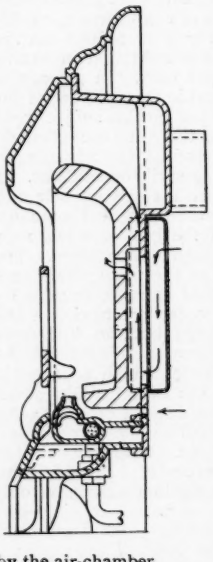


This invention consists in providing means for the direct conduction of the heat of the flame to the outside of the burner, "so that no injurious heating of the burner-tube, or the gas-pipe connected thereto, can take place."

The bunsen burner and mixing-chamber are provided with a nozzle M of heat insulating material, from which the incandescent body is suspended. Directly above the burner orifice is a metal cap C, part of which is outside the glass shade. The cap is provided with shaped projections D, the object of which is to give off, by surface radiation, the heat conducted to it by the burner, and at the same time to deflect from the other burner parts the heated gases of combustion. The burner-tube F is connected to the cap C by a heat insulating intermediate part H, and is provided at I with a second insulating part. At this point, another metal cap E is provided (hemispherical in shape), the object of which is to give off, by surface radiation, the heat which it receives by conduction. Above this cap is another heat insulator K. At its upper end the burner-tube is provided with heat insulators L and N, between which is mounted another hemispherical cap, the purpose of which is the same as that of the cap E.

Gas-Fire Stoves.—Fletcher, Russell, and Co., Limited, and Neil, J. & W. R., of Warrington. No. 2337; Jan. 30, 1904.

This invention relates to gas-fire stoves such as are constructed with a fire-clay or metal back in a metallic shell; the back having a ledge at the bottom, at the front, on which to stack asbestos or like balls or cobbles through which the flame from the gas-jets at the base is diffused. The object of this is "to obtain increased heat without increasing the quantity of gas consumed."



As shown, a space is left between the base of the fire-clay back and the top of the tube or chamber in which the gas and air is mixed before passing to the burners. The space at the sides of the mixing-chamber, and between the mixing-chamber and the metallic shell, is sealed so as to prevent down-draught causing ignition at the supply tube. Air is admitted through a series of holes in the lower part of the case, and passes to the burners over the mixing-chamber through the space formed between the chamber and the bottom of the fire-clay back—thereby cooling the mixing-chamber. There is formed on, or attached to, the outside of the back of the metallic case an air-chamber, extending from near to, but above, the holes in the case to a little below the outlet pipe to the chimney placed above the top of the fire-clay back; also there is a series of holes in the upper portion of the air-chamber, and a series of holes in the lower portion of the metallic case covered by the air-chamber.

The part of the fire-clay back that is placed against the metallic shell is fluted or hollowed out, so that only the outer edges rest against the metallic case; and a series of holes are formed in the upper portion of the fire-clay back. Air enters through the holes in the upper part of the air-chamber at the back of the metallic shell, passes down to the holes in the lower part of the shell within the air-chamber, returns up between the shell and the fire-clay back, and passes out over the gas-flame and the upper strata of asbestos balls or cobbles—being superheated in its circuitous passage from the back to the front of the stove.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Award in the Nantwich Arbitration.

SIR,—Concurrently with your comments upon the above, appears, rather opportunely, your report of some observations upon what should be the governing principle of such awards, which have been made recently by Sir George Livesey, in his capacity as Umpire in another arbitration. Sir George appears to have quoted Mr. Shiress Will as having stated that the principle ought to be to give the shareholders such a price as would enable them to secure as good an income as they had been getting. May I point out that in the case of Nantwich the Company will get a great deal more than this? The award gives them a greatly increased income, whether the yield of equivalent securities be reckoned at 5 or 4½ per cent. Five per cent. upon the amount awarded—namely, £68,148—equals £3427; whereas the utmost maintainable profit the Company were able to claim was £2629, from which a substantial deduction should be made for rates, because the new works have not yet been assessed.

If compared with the position of the Company, as defined by themselves in their Bill of 1903, the award is equally startling. The paid-up capital is therein stated as consisting of £12,000 ordinary shares, carrying 10 per cent. standard dividend; £5000 5 per cent. preference shares; and £7000 of 4 per cent. debentures. Then the total capital charges, according to the Bill, were £1730; and the award is equal to 39 years' purchase of this sum. This, however, is not all. One half of the ordinary capital, or £6000, had been newly created out of revenue, which had accrued after payment of more than 13 per cent. to the shareholders. It is not unreasonable to suppose that Parliament would not have allowed upon this moiety more than a fixed dividend of (say) 5 per cent.; and the award is equal to 47 years' purchase of the capital charges thus reduced. Deducting the preference capital and debentures from the amount awarded, there remains the sum of £56,000, or thereabouts, for the fortunate possessors of the ordinary capital, only one-half of which—£6000—was originally subscribed by the shareholders; the other half having, as already stated, been contributed out of surplus revenue.

There has been some jubilation over this award, as being a defeat for municipalization. But can it be also said that it is a good thing for gas interests generally? In all probability its effect will be to permanently increase the already high price of gas in Nantwich, or else to increase the rates. Such a prospect is not a pleasant one for any industrial community, nor is it one that can be regarded with satisfaction—especially in these days of competition—by any well-wisher of our industry.

15, *Victoria Street, S.W., April* 29, 1904. CHARLES HUNT.

Stops—Not Slots.

SIR,—Although your correspondent comes down so heavily upon one of the best friends of the modern gas administrator—the slot meter—it seems to me very remarkable to charge it with special unfairness to certain classes of customers, as if the stop meter, the ordinary meter, and, in fact, any system of scale charging, whether applied to the sale of gas or any other commodity, can be absolutely equal under every set of conditions.

The stop system has great advantages to the supplier, in that he gets his money in advance. On the other hand, a small floating balance of safety must be subscribed by each consumer to avoid the light going out. But where he gains any advantage over his brother slot customer it is difficult to see. I willingly admit that different practices may obtain in different districts, and an injustice may arise under such circumstances; but this is common to both (or any) systems.

I have gone pretty fully into the question of supplying slot customers, and have now more than twice as many slots as ordinary meters at work; and my practice has been for a good many years to charge an additional 5d. for a meter alone, and 10½d. when a cooker and fittings are supplied as well. I have a scale of "returns," by which a consumer of over 2000 cubic feet has a small return, and consumers of larger amounts have a return which, after paying for the gas at the ordinary scale of charges, and 1s. 6d. meter-rent, places them on an equality with the ordinary customer. The advantages of this system are very considerable—

(1) It is popular with the customer.
(2) It meets the vicissitudes of ordinary gas supply. During the seven or eight years it has been at work, the price of gas has been lowered, raised, and now again twice lowered.
(3) Many slot customers have cookers on ordinary rental. By means of the "returns," separate collection is avoided.
(4) Several customers have paid off outstanding arrears by means of the "returns."
(5) The very small consumers are rendered less unprofitable; and as these are of the very poorest, any little advantage they still have may be looked at charitably.
(6) The return system makes our dealings with all classes as nearly equal as possible.

I may say that, at the end of each quarter, I have the amount of gas, as ascertained from the readings of the slot meters, charged in the rental at the ordinary price, the meter-rent added, and the balance goes to the cooker account; and as it works out at nearly 10 per cent. on the outlay, I have no doubt in my own mind that I am working on right lines, and that no one class of customers is paying for another.

Ilkeston, April 30, 1904. F. C. HUMPHRYS.

The Earl's Court Gas Exhibition.

SIR,—The article on the above subject, contained in your issue of April 19, foreshadows the appearance of a prospectus, compiled by the Council of the Gas Institute, giving details of the forthcoming exhibition. Would it not be advantageous, before doing this, to invite delegates appointed by the various classes of manufacturers to discuss with the Council the best means of carrying out in detail the scheme of the exhibition? Such discussion would ensure the bringing out of a prospectus so explicit that everyone concerned would know exactly what would be required, and would be able to proceed at once with his part of the scheme, without having to lose valuable time later in seeking reliable information. November seems a long way off; but it is surprising how quickly time appears to fly in preparation for an exhibition of an international character.

In the article previously referred to, you speak of "profit, apart from the space receipts," being handed over for benevolent purposes. It would be well to know if the exhibitors, in addition to their heavy outlay in providing exhibits, attendants, &c., will also be asked to pay in full for space taken. The object of the exhibition is not, I suppose, that of making money, but to demonstrate to the general public the commanding position of the gas industry at the present time, and to show to those more intimately connected with it the wonderful advance during the last few years in every section. Being held, therefore, for the mutual benefit of everyone engaged in the industry, I presume that the financial burden of all taking an active part in the exhibition will be lightened as far as possible, and that the money devoted to charity will be taken out of the profits *after all deduction of expenses.*

There is one other point about which I am curious. As the exhibition is to be an international one, there will probably be a large display of foreign-made articles. Assuming that I have been dealing for some time in a satisfactory manner with our English gas companies, and that my articles are quite as good as those exhibited by foreign firms, but that I cannot make and sell them in this country as cheaply as they can, am I likely to find, after all the expense I may have gone to, that I shall be thrown over in favour of the foreign exhibitors (for we know the spirit of cheapness is very much in evidence these days), or will the English gas companies continue to support their own home manufacturer?

If I am to be thrown over solely on this account, I suppose I shall be entitled to some of the money for benevolent purposes at the close of the exhibition.

April 29, 1904. HERMIT.

Estimation of Naphthalene in Coal Gas.

SIR,—In the "JOURNAL" for March 27, 1900, there was described a method of determining the quantity of naphthalene in coal gas, by the aid of picric acid. We have tried the method several times very carefully, but only found a trace in our gas. Seeing that later tests made at English gas-works free from naphthalene trouble show from 3 to 17 grains per 100 cubic feet (see "JOURNAL" for March 22 last, p. 767), permit me to ask whether the method is exact, or is there a better one? I may say that we have little naphthalene in our pipes on the gas-works, and not much in the town. We use about 10 per cent. of carburetted water gas, and about 4 per cent. of air.

I should be very glad to have an answer to the question from one of my English colleagues acquainted with this matter.

Copenhagen, April 25, 1904. J. IRMINGER.

Curious Cause of Decreased Gas Consumption.—A diminished gas consumption is being experienced at Oldham, which, besides being due to bad trade, is said by the General Superintendent (Mr. Arthur Andrew) to be caused by two families going to live together in one house—a charge which had been made in many instances. The consumption for the fortnight ending April 18 was about 32½ million cubic feet, which was a falling off of nearly a million feet.

Gas-Meter Testing in Manchester.—The annual report of the Gas Meter Inspector, which was submitted at a special meeting of the Manchester City Justices last Thursday, stated that during the year ending March 31, 44,518 meters had been tested—an increase of 4616 as compared with the previous year. The fees received amounted to £1729, as against £1432. Altogether 868 meters were rejected, or 1·95 per cent. Of the 14,074 wet meters tested, the number rejected was 337, equal to 2·4 per cent.; and out of 29,576 dry meters, 531 were condemned, or 1·76 per cent. Since the establishment of the department in 1862, no fewer than 632,266 meters had been tested; the fees amounting to £20,547.

Gas-Ovens in London Restaurants.—The report of the Medical Officer for the City of London (Dr. Collingridge) for the four weeks ending the 12th ult. contains comments on what has been observed in regard to the condition of the kitchens and kitchen staff in a good many London restaurants. After premising that underground rooms are exceedingly unsuitable for kitchens, but that in many cases no other position appears possible under the circumstances, the report continues: "The nature of the fuel used in cooking is of considerable importance, affecting as it does the smoke problem; and the adoption of gas-ovens where it is possible is always an advantage, especially when constructed so that fumes do not come in contact with the food during the process of cooking."

Edinburgh and Leith Coal and Meter Contracts.—A special meeting of the Edinburgh and Leith Gas Commissioners was held yesterday (Monday) to consider and deal with the recommendations of the Works Committee as to the purchase of coal and other stores for the gas-works for the ensuing year. The tenders received were sent by the Commissioners, at their meeting last week, to a small Committee to consider. They having reported to the Works Committee yesterday forenoon, that body, sitting afterwards as Commissioners (all the members of the Commission being upon the Works Committee), considered in public the resolutions they had come to in private. Bailie Bryson (Leith), who presided at the meeting of the Commissioners, said the Works Committee had agreed to recommend the purchase of 84,000 tons of cannel and 117,000 tons of other coal. The price of the cannel was on an average 7d. per ton less than last year, and that of the other coal 7½d. per ton less. The recommendation was unanimously adopted. The contract for meters was divided between Messrs. R. Laidlaw and Son, Limited, and Messrs. James Milne and Son, Limited.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Amersham, Beaconsfield, and District Water Bill, Thurles Urban District Council Water Bill.

Bills read a second time: Bishop's Stortford and District Gas Bill, Brixham Gas Bill, Chippenham Gas Bill, Colney Hatch Gas Bill, Croydon Gas Bill, Felixstowe Gas Bill, Kirkby-in-Ashfield Urban District Gas Bill, Norwich Water Bill, Ryde Gas Bill, Sheppy Gas Bill, Southend-on-Sea Gas Bill, Sutton Gas Bill.

Bills reported: Chesterfield Gas and Water Board Bill, Corbridge Gas Bill, Ebbw Vale Urban District Water Bill, Hampton-in-Arden Gas Bill, Harrogate Water-Works Tramroad Bill, Leeds Corporation (Water-Works) Railway Bill, Norwich Water Bill, Shipley Urban District Council Bill, Wellington (Somerset) Gas Bill.

Bills read the third time and passed: Corbridge Gas Bill, Ebbw Vale Urban District Water Bill, Hampton-in-Arden Gas Bill, Shipley Urban District Council Bill.

Bills Royal Assented: Appleby Corporation Gas Bill, Southend Water Bill.

The Gaslight and Coke Company have petitioned against the Marylebone Electric Lighting Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read the first time, and referred to the Examiners: Appleby Corporation Gas Bill.

Bills reported: Crystal Palace District Gas Bill, Gosport Water Bill [Lords], Huddersfield Corporation Act, 1902 (Amendment) Bill [Lords].

Bill read the third time and passed: Thurles Urban District Council Water Bill.

GLEANINGS FROM THE COMMITTEE ROOMS.

In every line, the work of the past week in the Committee rooms has been of a light character. It was found in the early part, that the Bill of the Crystal Palace District Gas Company had at length been transferred to the unopposed list; and, as will be seen below, it has made further progress. The Chairmen of Committees have been busy with long lists of unopposed measures; and the particular ones in which we are interested have been ordered to be reported for third reading. The Lothians Electric Power Bill, which was in the Earl of Lauderdale's group, has become an unopposed measure—the whole of the opposition having been withdrawn. The settlement includes important clauses for the protection of the Local Authorities in the counties affected, as well as of the Edinburgh Corporation, the Edinburgh and Leith Gas Commissioners, and the Edinburgh Water Trustees. In the final paragraph of the notes in last week's issue, reference was made to the success of the Ebbw Vale District Council with their Bill, by which they are being empowered to construct a new reservoir. The decision of the Earl of Camperdown's Committee was accompanied by a provision that the quantity of compensation water to be given should be subjected to the judgment of an arbitrator. A clause has been arranged appointing Mr. Charles Hawksley as referee; and it provides that he is to form his decision on the readings of rain-gauges during the next three years, on the basis of compensation of one-fourth of the rainfall.

Crystal Palace Gas Bill.

The Bill of the Crystal Palace District Gas Company is now being pushed forward. Last Thursday it was before Lord Balfour of Burleigh; and the next day it also made an appearance before Mr. J. W. Lowther's Committee as an unopposed measure. Sir Chandos Leigh took a very lively interest in the remains of the measure; and Sir Fortescue Flannery, M.P., who is a Director of the Company, was an interested spectator. Mr. H. L. Cripps, the Parliamentary Agent, conducted the proceedings; and he was assisted by Mr. C. F. T. Blyth (the Solicitor), and Mr. Charles Hunt, who is a member of the Company's Board. Mr. S. Y. Shoubridge and Mr. Chas. M. Ohren were also in evidence looking after the interests of the Company. The various steps which have brought the Bill to its present position have been so fully noted in previous issues that part of the opening statement of Mr. Cripps would have no fresh interest for readers. But he explained that the provisions as they now stand will, in certain respects, assimilate the actions of the Company with those of the South Metropolitan Gas Company. Reference was made to the change of the name of the Company to the South Suburban Gas Company; and then it was noted that section 4 provides, in connection with the standard price and sliding-scale arrangements, for the accounts being made up half-yearly, instead of yearly as provided by the existing Acts. The new system is in accordance with that in force in the case of the South Metropolitan Gas Company. Clause 6, which has reference to the issue of stock to consumers and employees, gave rise to some little discussion, as it did when first introduced in the case of the South Metropolitan Company. As Mr. Cripps pointed out, in that, as in every case in which the power has been granted since, it was and has been strongly and successfully urged that some facilities should be given for interesting the consumers and employees in the concern—the clause, in fact, is almost identical with the words in the South Metropolitan Act. The fact that the stock is to be offered at, as near as may be, but not more than 3 per cent. below, the average market price of the previous month, was hung on to as a matter for some slight question. The Committee were reminded that in the case of the Croydon Company 5 per cent. was allowed; but Sir George Livesey thinks 3 per cent. is sufficient. Sir Chandos Leigh called attention to Standing Order 188, providing for the offering of "additional capital by public auction or tender at the best price which can be obtained, unless the Committee on the Bill shall report that such provision ought not to be required, with the reasons on which their opinion is founded." A little discussion as to the opposition of the clause to the Standing Order ended in the Chairman remarking that the Committee had better refer to the matter in their report. On the clause as to the appointment of Employee Directors, Sir Chandos Leigh again interposed, mentioning that the clause varied that of the South Metropolitan Company by omitting reference of the matter to the Board of Trade, after approval by the proprietors. The arrangement is essentially an internal one as between the Company and the employees; and Sir George Livesey is of opinion that, after the satisfactory experience of the South Metropolitan Company, it is not a question upon which the Company need trouble the Board of Trade. As Mr. Cripps put it, when the South Metropolitan Company obtained the sanction of Parliament to the appointment of Workmen Directors in 1896, it was only an experiment on their part; and it was then thought desirable that the scheme should be presented to the Board of Trade for their approval. The Board did consider the matter then, and regarded it as applicable. Mr. Lowther, however, held that the promoters should be put under exactly the same provision as the South Metropolitan Company. Mr. Hunt proved the preamble of the Bill; and it was ordered to be reported to the House. As it has been remarked on a previous occasion, these clauses of the Bill are worth saving; but they are not worth the price that the obstinacy and short-sightedness of the Local Authorities have compelled the Company, and through the Company the consumers, to pay for them. The expenditure over last year's Bill and the present one is estimated at £6000—perhaps it will be more; and this money has all to come out of the pockets of the consumers!

Protection of Gas and Water Pipes in Edinburgh.

In the opening paragraph, reference is made to the fact that the promoters of the Lothian Electric Power Bill have agreed to insert clauses protecting the interests of the Edinburgh and Leith Gas Commissioners, the Water Trust, and the Water of Leith Purification Commissioners. Mr. W. R. Herring has kindly complied with a request made to him for a copy of the clauses, which, it is a pleasure to learn, were agreed upon and adjusted at a meeting in Edinburgh, without the heavy expenses that would have attended the coming to Westminster to fight these matters out. The clauses are, in their importance, a great gain to the three bodies mentioned. It is seen that they have obtained full protection against electrolysis, as well as other defensive provisions, and the imposition of all liability for damage upon the promoters; so that they have good reason to congratulate themselves. In the first place, the promoters of the Lothian electric power scheme are prohibited from interfering with any of the mains, pipes, or other works of the Gas Commissioners, Water Trustees, or the Purification Commissioners; but, in the event of any alterations being required, the work is to be executed by those to whom the pipes or other property belong, and the cost incurred is to be defrayed by the Lothian Company within three months after a detailed account has been rendered—any dispute being determined by arbitration. Right of access, at any time, to mains, &c., and to protective works, is given to the respective Commissioners and Trustees. Provision is also made for notices by the Company, for the submitting by them of plans and sections of their proposed operations, and for the "reasonable approval" of the Engineers of the three bodies. The electrolysis clause reads:—

> The Company shall make full compensation to the Water Trustees, Gas Commissioners, and Purification Commissioners respectively for any loss or damage which may occur to any of their mains, branch and service pipes, or other works, owing to, or arising from, the supply of, and use of, electrical power under the provisions of this Act, including damage due to, or arising from electricity in, or escaping from, any of the works of the Company, and shall free and relieve the Water Trustees, Gas Commissioners, and Purification Commissioners respectively from all liability in respect of any loss or damage due to or arising therefrom.

Then any additional capital expenditure incurred by the Commissioners and Trustees in consequence of the operations of the Company is to be borne by the latter. Furthermore, the Commissioners and Trustees are not to be liable for any loss or damage which the Company may sustain by the exercise, in a reasonable manner, of any statutory powers possessed by the former. There are other clauses of a minor character; but from this summary, it will be clear that the Gas Commissioners, Water Trustees, and Purification Commissioners have achieved something, quietly and in a friendly way, in Edinburgh that it is now found very difficult to achieve within the Committee rooms at Westminster. Here electrical promoters seem to be specially protected all round by Parliament and Government Departments from the approaches of gas and water suppliers who ask for those things which the Lothian Company have here recognized to be perfectly reasonable.

Tramway or Railway for Reservoir Work.

The pretty little dispute between two large Corporations—Harrogate and Leeds—which went to the length of both promoting Bills in Parliament this session, has been threshed out before the Earl of Camperdown's Committee, at the expenditure of the time of their Lordships and other people over four sittings. The whole question hangs round the Water Act obtained by the Corporations in the session of 1901, by which Act they were each authorized to construct certain reservoirs. In connection with the building of these, Harrogate wants to lay down a tramroad of 2-feet gauge, while Leeds propose a railway of 4 ft. 8½ in. gauge for carrying the material. Each Corporation preferred its own scheme; and therefore each asked the sanction of Parliament to its particular preference. Harrogate contended that they would save £5000 by using a 2-feet gauge line instead of the ordinary gauge, that they could get it ready in three months as against fifteen or eighteen months for the Leeds project, and that they would be in a position to carry 300 tons per day, and would be quite equal to the transmission of all the material

required at the Leeds reservoirs. On the other hand, the Leeds scheme was estimated to cost £31,000, as against Harrogate's £10,000; but Leeds held that, if the latter contributed to the larger project, the expense would be smaller to them than under their tramway proposals. Expert evidence was plentiful on both sides. It was estimated that the quantity of material to be conveyed for Harrogate was 30,000 tons, and for Leeds 90,000 tons; and it was held by Mr. Thomas Hewson, the City Engineer, that the 2-feet tramway would not carry in the time required the material needed by Leeds. The upshot of the discussion before their Lordships was that they allowed the Harrogate Bill to proceed, This decision was arrived at on Tuesday; and Leeds was allowed until Thursday to consider the position, by which time it was thought probable an agreement would be reached. On that day, a clause was inserted in the Harrogate Bill, providing that the Corporation of Harrogate should afford, and Leeds should exercise, facilities for running over the tramway, and that an arbitrator should be appointed by the President of the Institution of Civil Engineers in the event of the terms and conditions not being agreed upon.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Wednesday, April 27.

(*Before the* LORD CHIEF JUSTICE *and Justices* WILLS *and* KENNEDY.)

Weardale and Consett Water Company v. Chester-le-Street Co-operative Society—Water for Fire Extinction.

This was an appeal by the plaintiffs from a decision given in the Durham County Court by Judge O'Connor, who dismissed a claim by the Water Company to be paid by the defendants for water used from their own service-pipe, which supplied a cattle trough, for the purpose of extinguishing a fire which had broken out in a haystack on their premises. The plaintiffs' case was that they were entitled to charge for water used on private premises for the purpose of extinguishing fire, and taken through a fire-plug which had been placed on the premises for that special use. The defendants denied that they were bound to pay for the water, as it had been used for extinguishing fire under section 42 of the Water-Works Clauses Act. This section provides that the undertakers shall at all times keep charged with water all their pipes to which fire-plugs are affixed, and allow persons at all times to use such water for extinguishing fires "without making compensation;" and the learned Judge in the Court below held that, under this section, the Company were not entitled to charge for water used for extinguishing a fire, even though it was not drawn direct from a plug. The original claim was for £15 15s.; but it was agreed that the amount to be recovered if the plaintiffs were entitled was £5.

Mr. MEYNELL argued the case on behalf of the appellants, in the absence of his leader, Mr. MANISTY, K.C.; Mr. SIMEY represented the respondents.

Mr. MEYNELL said the question for the decision of the Court was whether his clients were entitled to charge for water used for the purpose of extinguishing fire on private premises when the water was taken from a pipe to which a fire-plug had been attached. In this case, a small sum per annum was paid by the Co-operative Society to the Company for water supplied for agricultural purposes. At the request of the defendants, the Company put a fire-plug upon the premises, attaching it to a private pipe; and the learned Judge said that the defendants were consequently entitled to take the water.

The LORD CHIEF JUSTICE: If the fire-plug were a few yards just outside the private premises, the defendants would have been entitled to have the water free for the purpose of extinguishing fire.

Mr. MEYNELL admitted that this was so. But unless the authorities had the plug put there, the defendants could not do it; and they were not likely to go to the expense, as the place was too far from the town. Counsel read the section of the Act relied upon, and argued that it could not confer a right upon a private person to use water on his own premises, and taken through a private fire-plug, without payment.

Mr. SIMEY, for the respondents, contended that there was nothing in the Act which required the water to come through a private fire-plug to be chargeable. In the case of water being used for extinguishing fire in a house, the water coming from a bath, he submitted that it could not be held that the water should be paid for. He also argued that as the water had been used on the occasion in question, it could be said to have been used "for agricultural purposes."

The LORD CHIEF JUSTICE, in giving judgment, said water companies were really trading concerns, but carrying on business under the control of Acts of Parliament. It was open to the Legislature to make such terms as it thought fit, when granting statutory powers; but he did not think any one reading the section cited could come to the conclusion that it meant what Mr. Simey must really contend for—viz., that water used for putting out a fire should always be free. To throw such an obligation upon a trading company, it must be in clear words, or words which at any rate involved that meaning as a necessary implication. This was not the case here; and therefore he thought the appeal must be allowed, and judgment entered for the plaintiffs for £5.

Justices WILLS and KENNEDY concurred.

The appeal was therefore allowed, with costs.

A De Brouwer Projector for Neath.—The Neath Town Council on Monday of last week adopted a recommendation of the Gas Committee in favour of the adoption of a De Brouwer projector for the gas-works, which will entail an expenditure of £2500. An annual saving of £800 is anticipated.

THE ASSESSMENT OF THE EXETER GAS-WORKS.

Further Hearing of the Gas Company's Appeal.

The hearing of the appeal by the Exeter Gas Company against the assessment of their property in the parish of Exeter was resumed before Mr. J. ALDERSON FOOTE, K.C., the Recorder, at the Law Institution, Chancery Lane, on Monday last week. The case was heard on the 11th and 12th ult. (*ante*, p. 169), when it was arranged that the speeches of Counsel should be heard in London.

Mr. BOYLE, K.C., in summing up on behalf of the Company, said he thought it would be useless to go in any detail into the principles applicable to rating, more especially as the case settled itself to a large extent by the evidence which had been given. There was no doubt that the parish of Exeter had for many years been receiving a great deal too much; and it was equally certain that St. Thomas had been having too little. This state of affairs had, however, now changed, and they both wanted to have too much. He did not propose to dwell at any length upon the evidence given by Mr. Mason, who was the only witness called by Mr. Ryde, as that gentleman had enunciated altogether a new principle—one, in fact, which he admitted he had himself never known adopted. He said that if he had followed the ordinary method of valuation, he should not have been able to support the figures. Mr. Mason was the only person who had the courage to propose such a novel experiment, which was not worthy of any serious consideration. Coming to the witness called by Mr. Macmorran, who dealt with the ordinary method of assessing gas-works, he said he did not think there was much difference between that witness and his own. His learned friend was fully justified in taking the highest valuation put in by the Company; and he, on his side, was equally justified in dealing with the lowest figure put in by his opponents, and in criticizing the evidence given on both sides. These two valuations were summed up in the words "Eve and Jones." Mr. Eve's valuation, including everything, came to £4463, and that of Mr. Jones to £4982; Mr. Jones putting the tenant's capital at £33,000, as against Mr. Eve's £37,000, which of itself more than accounted for the difference. Maintenance of works was put by Mr. Jones at £4359, and by Mr. Eve at £6640. Dealing with the item of tenant's capital, he pointed out that the difference between the two witnesses was accounted for by those on the other side having taken "stoves on hire, meters, prepayment meters, stoves in stock," &c., at the figure at which they appeared in the accounts, and not at their fair value, which was the sum that a hypothetical tenant would give. Then it was said the Company should collect their accounts quarterly instead of half-yearly, which was entirely a matter for the Court to determine; but it must not be forgotten that this alteration would entail an extra expenditure of some £500 or £600 a year.

The RECORDER: Assuming I said that quarterly collection ought to be adopted, the tenant's capital would be reduced; but "alterations and expenses" would not be reduced at all.

Mr. BOYLE said no doubt the two things were not reduced in the same ratio. He next submitted that the rate of interest ought to be 17½ per cent., and that the total rateable value should be divided in the proportion of one-third to the productive mains and two-thirds to the unproductive works. The owner of the mains had to be considered as well as the landlord; and he submitted that the consideration should be in the proportion of three to one, and that capital invested in mains should produce under such circumstances the same as capital sunk in works. In conclusion, he urged that the Company had established their case for the reduction claimed.

Mr. RYDE, for the Assessment Committee, thought, having regard to the evidence which had been given, the Court would have no difficulty in coming to the conclusion that the offer made by his clients, of £2250, was a very fair one. The assessment on which the Company had been paying since 1892 was £5129, or, in round figures, £700 beyond the amount named by Mr. Eve; and as the Company's turnover had increased by 25 per cent., the probability was that they had been paying, not on £700 too much, but on £1200, which would be a startling result to arrive at. It was said that this sum should have gone in extra dividend, or been put to the reserve fund; but it must not be forgotten that the Company had placed £14,000 to the reserve, and paid substantial dividends. Had they not had to pay this excessive rate, they would have declared higher dividends, and put by a larger sum. He challenged the statement that a tenant was entitled to receive 17½ per cent. interest on his capital. His case was that the tenancy was of such a character that the tenant wanted an enormous capital to enable him to carry on the undertaking. The effect of introducing the penny-in-the-slot customers had created such a disproportion between the tenant's capital and the landlord's, that the old rule of 17½ per cent. no longer held good; and he asked the Court to say that 15 per cent. was amply sufficient, and that he had shown a good case for cutting down the tenant's capital to £30,000. If the assessment appealed against were reduced, but to some figure not lower than the offer made by his clients, the proper order as to costs would be that he should have all those incurred after the date of making the offer; the other side having theirs down to the time the offer was made.

Mr. MACMORRAN, K.C., for St. Thomas, said that when Mr. Ryde was asked at what figure he put the rateable value, he fixed it at £5400, which was clearly founded on an allowance of 17½ per cent. for interest.

The RECORDER remarked that, and as he understood Mr. Boyle's contention, he put the tenant's capital at something between £30,000 and £33,000.

Mr. MACMORRAN said this was so; but the point he was chiefly concerned with was the distribution. After referring at some length to the evidence given by the different witnesses, he said, taking the sum at 4¼ per cent. on the works and 3¼ per cent. on the land, there was more than sufficient to justify the £3800 at which the assessment had been put. If the usual percentage was 5 and 4, which had not been contradicted, and the proper mode of rating was to make a deduction for non-productive works before distribution among the productive

parts was begun, was it fair for Exeter to raise the contention which was now being put forward? Supposing the Company were more flourishing, then the whole of the increase would go to Exeter and not to St. Thomas.

The RECORDER said he did not think he could allow 5 per cent. for the works, as it was a poor Company.

Mr. MACMORRAN said the whole system of valuation was as technical as could possibly be. Here the Company were paying maximum dividends, and yet the Court was invited to say that it was a poor concern. If it came to a question of figures, he thought he was fully justified in asking the Court to hold that not only was the Company not a poor one, but that his deduction of 5 and 4 per cent. was fully justified.

The RECORDER intimated he would give his judgment at the next Quarter Sessions.

Smart Sentence for a Prepayment Meter Theft.

At the Thames Police Court last week, a youth named John Julien was charged with stealing 3s. 4d. from an automatic meter-box, the property of the Commercial Gas Company. Mr. G. H. Young, who prosecuted, said that on the evening of the 13th ult., Mrs. Pickard, of Carlton Road, Mile End, went out for a few minutes, leaving the front door open. Prisoner and another youth took advantage of her absence to enter the passage, in which the meter was fixed. They forced open the padlock and took away the money-box, which at the time contained the sum named in the charge. The other youth was seen to conceal the box under his coat; and when the two got away, they took out the money and threw the box over a wall. On the way to the station, the prisoner threw away a long nail, on which were paint marks of the same colour as that on the box. Mr. Young remarked that between 300 and 400 of these robberies occurred in the Company's district every year; and what made the offences more serious was that they often took place under circumstances which might lead to an explosion. Prisoner was sentenced to three months' hard labour.

Progress of the Birmingham Welsh Water Scheme.—The members of the Birmingham Water Committee, who have just returned from a visit of inspection to the new works in the Elan Valley, are of opinion that, though a great deal still remains to be done, the consumption of Welsh water in the city will begin within the next few months. Of course, the full supply will not be available this year; but even an instalment will be very welcome, especially if the summer should prove to be a dry one.

Gas Profits at Blackburn.—A very encouraging report has been laid before the Blackburn Corporation Gas Committee with regard to the results of the working during the past twelve months. The total income on revenue account was over £114,000; and the undertaking realized a gross profit of £44,315, compared with £36,528 in the previous year. The net profit was £11,674, as against £4313 in 1902-3; and the whole of this sum is to be transferred to renewal account, to reduce a large adverse bank balance. The great increase in the profits is accounted for partly by the fact that better prices were obtained for residuals. The revenue from prepayment meters was £3000 more than in the previous year.

Sales of Stocks and Shares.—At the Mart, Tokenhouse Yard, E.C., on Monday last week, Mr. Alfred Richards sold, under instructions of the Directors, £12,500 of additional "B" consolidated stock of the Tottenham and Edmonton Gas Company, ranking for a standard dividend of 3½ per cent., but entitled to 4½ per cent.; this being the rate of the last dividend on the "B" stock. The prices realized ranged from £100 to £101 per £100 of stock. Mr. Richards also sold, by order of the Directors, 400 additional ordinary £10 shares (last dividend 5¼ per cent.) in the Lowestoft Water and Gas Company, at from £11 to £11 5s. each; and some 4 per cent. perpetual debenture stock, at from £104 10s. to £106 10s. per £100 of stock. On the same occasion, 173 fully-paid £10 new ordinary shares in the Southend Water Company fetched from £10 12s. 6d. to £10 15s. per share; and 15 fully-paid additional ordinary shares of the same nominal value (last dividend 5 per cent.), £12 each. A small parcel of £5 "B" shares in the Romford Gas Company, carrying a dividend of 9 per cent., were sold at from £8 10s. to £8 12s. 6d. per share. The following day, Messrs. Penney and Clark sold by auction at Portsmouth 300 £5 shares in the Havant Gas Company, at £6 17s. 6d. and £7 each. The amount realized by the sale was £2080 16s.; being a premium of £580 16s. At the Wheatsheaf Hotel, Ormskirk, on Thursday, Mr. P. Freeman sold by auction, by order of the Executors, 32 shares of £10 each in the Ormskirk Gas Company, at £20 10s. each.

Derwent Valley Water Board.—On the invitation of this Board, the members of the Midland Counties Institution of Mining Engineers made an inspection last Tuesday of the works now in progress in the Derwent Valley for supplying water to Sheffield, Nottingham, Derby, and Leicester. The Midland Railway Company lent the party several carriages for use on a light railway belonging to the Board, and the visitors travelled in this manner to Howden dam, where they alighted. They were shown over the dam by Mr. Windsor and his assistants. The foundations have been excavated to a depth of about 70 feet. The chief difficulty experienced in connection with the excavations has been the existence of wrinkles or faults in the strata. It has in consequence been by no means easy to provide suitable foundations for the huge weight of the dams. The bottom of the faults is considered to have been reached; but in order to render it certain that the dam will hold water, a further depth of about 30 feet has been excavated to a width of 6 feet below the main excavation. This will be filled with concrete, so as to prevent water percolating below. The dams proper will be composed of stonework, the material for which has been obtained from the Grindleford quarries belonging to the Board. The Howden dam is the top one of a series, the whole scheme comprising two dams in the Derwent Valley, two in the Ashop Valley, and one at Bamford. After visiting the Howden dam, the party went to the Derwent dam, which is about two miles below the other in the same valley.

MISCELLANEOUS NEWS.

THE CHARD ARBITRATION AWARD.

The Chard Corporation and the Gas Company have received the award of the Umpire in the arbitration which was held to determine the amount to be paid by the Corporation for the undertaking of the Company (see "JOURNAL," March 8 and 15, pp. 640, 708). The sum awarded is £35,240; and, in addition, the Corporation have to take up a mortgage debt of £5250, provide compensation for the officials, and pay the costs of both sides. In the arbitration proceedings, the Corporation valued the undertaking at £25,000; while the Company's valuation was £45,000. Last year's profit of the Company amounted to £1492; and, though the Corporation consider that the price to be paid is high, it is reported that they have confidence that the undertaking will prove remunerative to the ratepayers. Mr. E. H. Stevenson, for the Company, valued the undertaking at £45,503; the valuers for the Corporation (Messrs. Charles Hunt and Arthur Valon) making it £21,669 and £21,424 respectively. It may be remembered that Mr. Corbet Woodall was Arbitrator for the Company; Mr. W. A. Valon for the Corporation; while Mr. James Mansergh was Umpire.

THE NANTWICH ARBITRATION AWARD.

The Council Discontented.

At the Meeting of the Nantwich District Council last week—Mr. E. S. HAIGHTON presiding—the Clerk announced that the award of the Umpire as to the price the Council should pay the Gas Company for their undertaking was (as stated in our last issue) £68,148.

Mr. DAVENPORT said the award was a very startling one; and he thought Sir George Bruce imagined that Nantwich was a community of millionaires. The award worked out at 26 years' purchase, which for a non-statutory company was almost unheard of. The excuse was that the Company was a prosperous one, and that the works were practically new. What the Council had now to consider was whether the works would pay at the price given in the award; and he fancied that in the figures he had to present just a glimmer of hope would be found. In the year to December, 1903, the total income of the Company was £7136 13s. 10d.; and the expenditure £4306 14s. 5d.—leaving a net profit of £2829 19s. 3d. They could count on a saving of expenditure in one or two respects. The Council would save the Directors' and Auditors' fees (£140 14s. 10d.). Then repairs and maintenance worked out at £624 7s. 5d.—a sum which was admittedly excessive; and £400 would easily cover the cost, especially as the works were practically new. The saving on this item would therefore be £224 7s. 5d. Including these two sums the net estimated profit would be £3195 1s. 6d. There was then the loan, which, in round figures, would be £70,000. The amount to repay that with interest in 40 years would be, at 3¾ per cent., £3404 per annum; at 3⅞ per cent., £3471 per annum; and at 4 per cent., £3505. The deficiency on the present income would thus be £209, £278, and £310 respectively. The present price of gas was 3s. 9d. per 1000 cubic feet, and an additional 1d. per 1000 feet on the quantity now consumed would produce £133. So that if the price was raised to 4s., there would be an additional income of £399, which would more than cover the deficiency if they had to borrow at 4 per cent. The probable increase in the consumption of gas must not be lost sight of, nor the likelihood of some reduction in the price of coal. If they could get coal at 1s. a ton cheaper than 13s. 3d., it would make a difference of £160. They might reasonably expect this, as the Company had had coal at 11s. 6d. a ton. The wages and salaries amounted to £843 15s.; and it might be possible to effect a saving in that department. The Company's authorized capital according to the Bill was £40,000, upon which they would have been entitled to pay a dividend of 10 per cent., which was equal to £4000 taken from the pockets of the gas consumers; while, on the other hand, the Council would not take more than £3404 if they borrowed at 3¾ per cent., and, at the same time, they would be paying back £1700, which represented one-fortieth of the £70,000. If the Company had been a statutory one paying a dividend of £4000, they would have had to pay double the amount of the present award for the undertaking. So far as he could see, it might be possible with careful management to make the works pay without increasing the price of gas; and in forty years' time the works would belong to the town. He saw no possibility of lowering the price of gas. On the other hand, he thought perhaps it might have to be increased. If, however, they could borrow the money cheaply, he did not see why the works should not be a success in the future. He suggested that the Clerk should make inquiries as to the best means of raising the needful money.

Mr. LEA seconded the motion, remarking that he was inclined to express the hope that they would not be able to raise the loan. To him the award appeared unreasonable, having regard to the capital and position of the Company. The Council's valuer estimated the worth of the concern at £30,000, and the other side valued at something like £86,000. He did not know how the thing was worked out at such extraordinary figures, especially looking at the fees they had to pay. They had also to pay for the privilege of having the matter settled in London. A common-sense man nearer home would have done greater justice to the case.

Mr. BOYER said it was a monstrous thing whichever way they looked at it, that the original capital of the Company should be magnified into £68,000. It would be a big burden for the ratepayers.

Mr. HARLOCK said it was evident at the commencement of the arbitration that the Company had set out with the intention of bleeding Nantwich to the very last drop; and Nantwich was not in a happy position at present. The Council appointed at an enormous expense two experts to find out the value of the works, and the Company took

a similar course. These four gentlemen arrived at conclusions which had a difference of £50,000 between them; and it was left to one gentleman to decide what price Nantwich should pay for the works. He was amazed that this gentleman, without any consideration of the local requirements, of the workers, and of the manufacturers, should have awarded a price that would not even compare with the figures that were put before him at 4 per cent. interest. He entirely failed to understand the way in which Sir George Bruce had awarded the sum of £68,000. But there was no turning back; and he (Mr. Harlock) was still of the opinion that they were taking the right course in purchasing the works for the town.

Mr. GILBERT pointed out that some time ago they could have purchased the works for £20,000; but notwithstanding the additional capital invested since, he could not see how the £68,000 had been arrived at. There appeared to be no common sense in the decision; and to his mind it was a most unjust award.

Dr. TURNER also thought the charge was monstrous; but he did not think it was any use wringing their hands. The Company had made a very good bargain.

Mr. HINDE said the Council embarked on this undertaking with their eyes open, and now they were dissatisfied with the result. There was ground for dissatisfaction; but he did not see how they could get out of the difficulty. He was not one who would be inclined to turn back, even if they could.

Mr. CLOUGH was astonished that the experts should be so wide of the mark, after having the figures at the arbitration proceedings so clearly put before them, and that the Umpire, who had personally inspected the district, should fix a sum that would require largely increased profits to make the undertaking pay.

The CHAIRMAN said Mr. Davenport had given them a glimmer of hope; and if they put forth their best endeavours, they would make a success of the undertaking. The risk that would attend increasing the price of gas should not be overlooked. He was of opinion that a reduction would be followed by a greater consumption.

The motion was agreed to.

RATING APPEAL AT THE ANTIPODES.

Newspapers which have lately reached us from the Colonies furnish evidence that the local authorities at the Antipodes are not less keen than those on this side of the globe in squeezing gas companies, whenever they can, in the matter of the assessment of their works. A case has recently been decided at Bendigo—a city of about 30,000 inhabitants situated 100 miles by rail to the north-west of Melbourne—which exemplifies this. The Local Authority of the place, which was raised from the position of a borough to the dignity of a city rather more than 30 years ago, had a re-assessment of the Gas Company's works made by their valuer, a Mr. Putnam, who improved upon his valuation of last year by raising it from £1200 to £2964. Against this increase the Company appealed. The matter came before his Honour Judge Molesworth, and both sides of the case were well argued. Mr. Putnam justified the addition he had made by saying that when he fixed the value of the property at £1200 he understood that an agreement was in existence between the Council and the Company; but he found there was none. From his evidence, however, he does not appear to have been a very experienced valuer. On behalf of the Company, Mr. S. E. Figgis, the Engineer of the Ballarat Gas Company for 25 years, said that, as the result of an exhaustive analysis, he found Mr. Putnam had made a generous allowance for working expenses, but none for coal stock, which was necessary for guarding against railway or coal strikes. He pointed out that in Bendigo there were two special incidental risks—the chance of subsidences and breaking of mains through mining and losses through damage caused by electrolysis. Ordinary risks were spontaneous combustion of coal or coke, and explosions of gas, whereby the Company might be mulct in damages. Mr. H. M. Marks said that he valued the land (3 acres) at £300, and the buildings at £2645. Another witness for the Company was Mr. Percy C. Holmes Hunt, the Acting Engineer of the Metropolitan Gas Company of Melbourne, who gave particulars of the valuation he had made from the 1903 balance-sheets of the Bendigo Company. He said he had compiled his statement from that year's balance-sheets because he found that decreases in receipts had steadily been growing the few previous years. Owing to the operations of the Electric Light Company, there was a reduction in the Company's capacity in comparison with that of years ago. He said allowances should have been made for a sinking fund, and for reserve coal stock. He corroborated Mr. Figgis's remarks as regards risks. The Chairman of the Company (Mr. W. C. Vahland) followed. He called attention to the fact that in the year 1893 the Company had 300 gas-lamps in the streets under contract with the City Council, whereas now they only lit 183 owing to the electric lighting.

At the close of the hearing, his Honour reserved judgment, which he gave about a week later. He said the City Valuer had named £2962 as the figure which, in his opinion, a tenant would give for the undertaking; but he had not allowed for any statutory deductions. Three experts had been called, and there was very little difference in their valuation (making no reference to statutory deductions). Mr. Putnam assessed the property at £2962; Mr. Figgis gave the value at £2975; and Mr. Hunt at £2937. The two latter, however, made deductions; Mr. Figgis allowing £1269 and Mr. Hunt £1262. The chief point was whether or not these deductions should be made. After minutely examining and explaining the deductions, his Honour said he was prepared to adopt Mr. Figgis's figures. The only question between that gentleman and Mr. Putnam was as to whether deductions should be made. Mr. Figgis brought out the net annual value at £1642, after allowing for them, and said that a tenant would give this amount a year. His decision was that the appeal should be allowed, and he reduced the amount of the valuation from £2962 to £1642—the respondents to pay the costs. He added that he would have no objection to stating a case on the question of the deductions.

DUKINFIELD CORPORATION GAS DEPARTMENT.

Report of the Engineer and Secretary.

The Engineer and Secretary of the Gas Department of the Dukinfield Corporation (Mr. Harrison Veevers) has lately presented his report for the year ending the 31st of March. He states therein that the new stack of retorts on the regenerative system, referred to in the preceding report, continues to give excellent results in yield of gas and of coke for sale. Last year the former reached nearly 11,500 cubic feet per ton, which excelled all previous records. The total quantity of gas made was rather less than in 1902-3, due partly to bad trade and partly to the use of incandescent burners. In order to be prepared for a revival of trade, and the consequent greater demand for gas, Mr. Veevers suggests that additional carbonizing plant should be provided this year, by the erection of a new retort-house in place of the existing old one, which is unsafe. In his report for the preceding year, Mr. Veevers pointed out that as the borough was well supplied with slot meters and gas cooking-stoves, it would be advisable to temporarily stop the delivery of them. All the applications made during the past twelve months had his individual supervision. The total make of gas was 90,030,000 cubic feet, of which 77,395,000 feet were sold; the loss being 12,635,000 feet, or 14·03 per cent. The gas accounted for was apportioned as follows:—Cottages (ordinary), 37,576,700 cubic feet; ditto (prepayment), 8,920,350 cubic feet; mills, 23,754,470 cubic feet; public lamps, 5,709,051 cubic feet; works, offices, &c., 1,434,129 cubic feet. The total revenue for the year was £14,616; the expenditure, £9790—leaving a balance of £4826. Adding to this cottage rents £36, there was a sum of £4862 available for meeting annuities, interest and sinking fund, and bank interest. These amounted in all to £3392; so that there was a balance of profit of £1470, compared with a loss in 1902-3 of £228, reduced, however, to £70 by a sum of £158 standing to the credit of the profit and loss account on March 31, 1902. The net balance, therefore, is £1400. The gross cost of gas production per 1000 cubic feet sold last year was 2s. 6·37d., compared with 2s. 9·91d. before; and the net cost, exclusive of capital charges, 1s. 6·81d., against 1s. 11·99d. These charges (less the cottage rents) came to 10·35d., compared with 10·33d.; bringing up the total to 2s. 5·16d., against 2s. 10·32d. As the average price of gas was 2s. 9·72d., there was a gain of 4·56d., compared with a loss of 0·72d. in the year 1902-3.

ROYAL COMMISSION ON COAL SUPPLIES.

Evidence Bearing upon the Gas Industry.

(*Concluded from p.* 253.)

As one of the factors contributing to economy in the use of coal, the Commission took evidence in regard to the supply of natural gas. This was furnished by

Mr. RICHARD PEARSON,

the Managing-Director of the Natural Gasfields of England, who described the operations which are going on at Heathfield for the utilization of the natural gas found there. He explained that, after the discovery of the gas, he expected to hear that extensive explorations had been made to determine the extent of the gas-bearing area in the neighbourhood; but finding this was not done, he communicated with some American friends, who asked him to move in the matter. He located positions for six experimental boreholes to be made, and boring was commenced. In each and all of these gas had been struck at levels varying from 300 to 400 feet from the surface. The borings were started in the geological formation known as the Hastings bed, which in the Heathfield district was some 400 feet geologically above the Subwealdon boring at Netherfield, which was started in the Purbeck bed. They had ascertained the existence of a gas-bearing belt area of a thickness of 100 feet; but they had only proved the top gas horizon. Witness then proceeded to make the following statement: In searching for natural gas in the United States, three points are mostly held in view: First, have the rocks been disturbed? If so, no further time need be spent looking for gas. Secondly, is it an anticlinal formation? Thirdly, are any bituminous beds known to be below? Holding these points in view, I may say that in this part of Sussex we have got the iron formation of the Hastings sand practically not disturbed at all; that it is well known to geologists that the North and South Downs are simply the outliers of an enormous anticlinal; and that there are three successive bituminous beds known to lie immediately under the sandstones. Therefore there is every probability of the existence of a rich, extensive, and lasting gasfield. At Mayfield, about five miles from Heathfield, we have commenced boring in two positions on the Hastings sand, and in one we have already struck gas, while the other—at a depth of 300 feet—strikes a stratum of 20 feet, giving a splendid yield of petroleum. Mayfield lies, with regard to Heathfield, five miles north towards London—it is in the direction of Tunbridge Wells. We are now boring over some 200 square miles in the county of Sussex, and hope soon to prove large supplies of gas throughout this territory. At Heathfield, we are already supplying from 70 to 80 houses with natural gas for lighting (used with incandescent mantles), heating, and cooking. We are lighting the street-lamps in the town, and using the gas for the gas-engines employed in our own works. We have obtained facilities from the London, Brighton, and South Coast Railway Company to lay our pipes along their lines to supply the gas-works of the large towns in the vicinity.

With regard to the composition of the gas, in its native state it gives, in an ordinary batswing burner, a light of about 12-candle power. This lighting power is not a unique feature of Heathfield gas, as some of the American gas gives equal candle power. The great point in the future of the gas will be its value for providing motive power. Our engines at Heathfield consume from about 13 to 15 cubic feet per brake horse power, as against 20 to 25 cubic feet in the case of coal gas. These

figures are in themselves sufficient indication of the enormous saving that the general use of Heathfield gas will effect, as natural gas of this quality easily stands in front of all other fuels.

The following table will give a fair example of the volumes of gas needed to produce one brake horse power in any well-known make of gas-engine:—

	Cubic Feet.
Heathfield natural gas	12 to 15
Ordinary coal or town gas	20 ,, 25
Water gas	60 ,, 80
Producer gas	100 ,, 120

Taking London and the South of England as a whole, every pound of coal burnt in gas production has to be carried by rail or water from a great distance. If we can prove that we have one immense gasfield lying under the whole of the Weald, we can revolutionize the industrial life of the South. The iron is there, the sand is there; and both can be worked with fuel on the spot—that fuel issuing from the earth in huge quantities, and being the cheapest in the world. I feel certain that a good supply of gas will be found—a supply at great pressure, of undoubted permanency. In the United States there are some 11,000 wells bored. At Heathfield at present we have nine, and are sinking ten others. There is indubitably sufficient gas-bearing land to warrant the boring of many thousands; and I can only say that thousands of wells will be bored. We are now being asked, "Can I have land with gas on it?" for this or that industrial purpose. The Company have acquired freeholds, though not to a very great extent; but we have mineral rights over some of the largest estates in Sussex, paying the landowners a royalty for their gas rights.

In answer to questions put to him upon his statement, Mr. Pearson said his Company had a gasfield as large as that of Pittsburg, and they anticipated a demand for their gas for domestic use. It would be sold in bulk to the gas companies in the South, who must certainly obtain their coal from the North. It would be impossible to give an idea of the quantity of gas they would be able to raise out of their area, but he thought it would be sufficient to supply not only Brighton and Eastbourne, but London as well. Having in their district a horizon of 100 feet of gas at a pressure of 200 lbs., the volume was something tremendous. They had blown off a million cubic feet a day as waste. Of course, he did not say they could continue doing this for a week, or anything of the sort; but they had never seen one of their wells diminish in any way. Five of the wells were more than sufficient to supply Heathfield; and, on an average, there had been a yield of 200,000 cubic feet of gas per day from each. He could not, however, say it would keep at this figure; but he hoped it would. The life of the American wells was, he believed, from 7 to 21 years. Asked if any works were being started for the utilization of the gas, witness replied that the Company had been approached by cement people and others from different parts of the country; but the first place it was contemplated to serve was Eastbourne, or else some plate-glass works which had been proposed at Heathfield.

Another and most important factor in connection with coal economy is the utilization of blast-furnace gas, some valuable information on which subject was given to the Commission by

Mr. B. H. Thwaite, Assoc.M.Inst.C.E., F.C.S.

Witness said it was in the year 1894 that he first realized the great value of carbon monoxide as the ideal thermal agent for direct power production in internal-combustion engines. He found, by extended experimental investigation, that the slow inflammation characteristic of this gas developed an indicator diagram that was almost ideal for the transformation of heat into work in motors. He also proved that as a combustible agent diluted with 70 per cent. of inert gas, it could be compressed up to eight atmospheres without danger of self-ignition. Further experiments showed that, when it was diluted with four times its volume of inert gas, equivalent to 80 per cent. of inert gas, it could be compressed or increased in density to a degree that secured its immediate ignition in a gas-engine cylinder, even when the speed of the piston represented 80 Otto cycles of operation per minute. These facts led him to investigate the characteristics of the gaseous effluents from iron-making blast-furnaces; and this investigation resulted in his invention which was patented in May, 1894. Briefly summarizing the advantages of carbon monoxide, witness said they were: (1) After combustion, only the thermal loss due to its sensible heat, no latent heat loss; (2) an ideal and controllable expansion curve securing steady running; (3) a greater mechanical efficiency output; (4) less liability to pre-ignition with high compression; and (5) after compression perfectly reliable and controllable ignition. Gas of low combustible value or power, relying for its thermal effects on its 20 to 30 per cent. volumetric percentage proportion of carbon monoxide, would sometimes actually refuse to ignite at ordinary atmospheric pressures, but would ignite with unfailing regularity after compression. Having given an account of the testing of his invention at Wishaw, Mr. Thwaite said he demonstrated in England the value of the system applied to gas of exceptional thermal poverty issuing from the Frodingham furnaces. This gas had occasionally only some 20 per cent. of carbon monoxide, representing its thermal value *plus* 1 per cent. of hydrogen. In 1897, he received a report from the managers stating that the experiment they had made was very satisfactory, and that they were prepared to give the process a practical trial on a large scale. Afterwards the value of the system was demonstrated by him on the Continent; pioneer plant being erected near Essen in 1897. This installation, after lengthened and exhaustive tests, was subsequently extended, as far as the treatment plant was concerned, to 4000-horse power. The system had now been adopted very extensively all over Germany and Belgium, and engine builders had installed it in Austria and Russia. The progress of the system on the Continent, and its influence on the development of the capacities of gas-engines, resulted in the suberb display of blast-furnace gas-engines at the Düsseldorf Exhibition in 1902.

Having been questioned on certain points in the preceding statement, Mr. Thwaite proceeded to demonstrate the value of the blast-furnace gas power system as a saver of coal, and consequently a matter of national importance. On this subject, he said: The thermal efficiency superiority over the system of generating power by steam generally in use in our British iron-works—neglecting its safety advantages, smokelessness, and practical independence of a continuous water supply—will be understood from the following example: The thermal efficiency of the steam-engine at one Belgian iron-works, with steam-boilers fired with unpurified blast-furnace gas, has been estimated to equal only 2·5 per cent., or only one-tenth that of the purified blast-furnace power gas-engine system. Other computations place the rates at a higher level; and the generally accepted figure is that the thermal efficiency of iron-works steam-power plants is only one-fifth that of the internal-combustion engine. The President of the Iron and Steel Institute calculates that in Cleveland there is in the blast-furnaces of the district a constant gas waste equivalent to 60,000 indicated horse power per annum. Taking 3 lbs. of coal per horse-power-hour, this means a yearly loss of 750,000 tons of coal. I would allocate the expenditure of the thermal assets represented by the blast-furnace gas effluents as follows:—

	Per Cent.
Heating the air blast (high-efficiency stoves)	22·5
Providing power for blast-furnance	9·0
Waste	10·0
Balance available for external power demand	58·5

Taking as the basis of calculation a blast-furnace producing 100 tons of iron per day of 24 hours, and assuming that a ton of coke fuel is expended per ton of pig iron produced, and that 95 cubic feet of gas are used to develop one indicated horse-power-hour, and that 150,000 cubic feet of combustible gas are produced per ton of fuel charged into the furnace—all these assumptions being justified by experience—then $150{,}000 \div 95 = 1579$ indicated horse power will be available from each ton of fuel, if all the gas could be diverted to purposes external to the furnace requirements. But we know that only 58·5 per cent. of the gas can thus be so diverted: $(1579 \times 58{\cdot}5) \div 100 = 923$ indicated horse power. Therefore it is $(923 \times 100) \div 24 = 3845$ horse power per hour that will thus be available, if the conditions are completely and ideally satisfied, from each furnace having a daily output of 100 tons of pig iron. If we take the iron output of Great Britain to be represented by that for the year 1900—*i.e.*, 9,448,840 tons—and take 25 cwt. of fuel (coke) to the ton, to allow for the high figures of Scottish and some Midland furnaces, then the available power works out to 1,190,000 indicated horse-power-years. If the blast-furnace gas now employed in stoves is also diverted for power purposes (by firing the hot-blast stoves with producer gas), then the aggregate power potential is increased to 1,457,000-horse power. Assuming this were fully utilized in displacing steam power consuming (say) 3 lbs. per indicated horse power, then this displacement would mean a national saving of $(1{,}190{,}000 \times 8670 \times 3) \div 2240 = 13{,}820{,}000$ tons of coal; and this neglects the saving that might be secured by diverting the gas from the stoves. Estimating the value of this coal at 6s. 6d. per ton delivered at the generating station, the annual economy is represented in financial terms by £4,991,500. We can test these figures as follows: Assuming the value of the fuel *per se* to develop one indicated horse-power-year to be £3 15s. (neglecting the saving in labour, water, depreciation, and assurance), this equals the sum of £4,462,500. Even if this figure of financial economy is divided by half, representing £2,231,250, this, capitalized at 5 per cent., would mean that the waste of fuel would justify a capital expenditure of £44,625,000 sterling on plant for utilizing the gas to produce power in internal-combustion engines, whereby this waste would be prevented. Some of our iron experts are asserting that the future of the inland iron-works in Great Britain is very dark, and that the works must either be removed to the sea coast, or suffer inevitable extinction under the severe competition with which the country is faced. It would be possible to recover from these inland blast-furnaces a dynamic power potential of some 430,000 indicated horse power, which should have an annual value of £806,250; and this profit alone would justify the expenditure that could be wisely incurred in modernizing the furnaces. If the owners of British inland blast-furnaces take full advantage of the power potential of their now wasted power gases, there need be little fear of the complete extinction that is threatened by foreign competition. Calculation will show that if only half the total amount given as the financial saving is secured, this will mean a return from the sale of power potential equivalent to 4s. 7d. per ton of iron made. This financial advantage is sufficiently substantial to justify the policy of the owners of inland blast-furnaces in insisting that, in all electric power transmission schemes, the power potential of their furnaces, at a reasonable rate to be determined, shall be utilized in generating the electric energy.

In answer to questions on this portion of his evidence, Mr. Thwaite said the cost of an installation necessary for plant making 100 tons of iron ore per day was about £10 per horse power—3845×10, or, roughly, £40,000; but the larger the iron-works, the more economical, on the whole, the making of the gas would be. It was put to witness that there was this difficulty at present—that all blast-furnace firms who have no gas-engines for the production of power, consume the whole of their gas in raising steam, and have no surplus to sell. If they sold it, they would have immediately to burn coal under their boilers. It consequently followed that they would first have to be satisfied that gas-engines would do their work and supply all their power besides heating their stoves, and that they would require to have a surplus before they could go to somebody outside. Witness said that was true; and it was a very important question, which enabled him to explain something. He went on to say he had a photograph of a gas-engine, at the Clay Cross Iron-Works, which was placed alongside the steam-boilers. Sometimes they had not been able to get the steam at all for their present engines. As a matter of fact, they had worked that engine, which would develop 300-horse power, and could easily have got up to 500-horse power. The gas it used did not interfere in the least with the supply for the steam-boilers. The economy was so great, and the expenditure of gas so small, that they did not feel it. Mr. Briggs, who was putting the questions, said he was quite persuaded that witness was right, and that it was much more economical. The great difficulty, however, which stood in the way of electrical power people taking blast-furnace gas was that they said they wanted it all; and that was the fact. Witness replied: "But supposing now they

are using 3000-horse power in their boilers for their engines. You multiply that by four, which makes 12,000-horse power; and deducting 3000 from 12,000, you have 9000 horse power to give away, and you get the power all the same." He added that what he meant to say was that his method of using up the gas would be four times as economical as burning it under a boiler and turning it into steam. "Then," said Mr. Briggs, "the first great point is to convert the blast-furnace people to this—that as soon as they have a surplus of gas they should sell it to people who wish to use it." Witness said this was so. In reply to further questions, he said he had observed a difference between the readiness with which this subject was taken up in Germany and in England, and he thought it was largely due to the condition of technical education in the two countries.

We close our selections from the report by giving some extracts from the evidence of

Mr. M. LONGRIDGE, M.A., M.Inst.C.E.

Witness had been asked to give evidence with regard to the economies effected in the consumption of coal consequent on the improvements made in engines and boilers during the past 25 years. He said his experience had been almost entirely with stationary engines and boilers. In dealing with the improvements made, he thought it would be convenient to consider separately: (*a*) Improvements in boilers, in the generation of steam; (*b*) improvements in steam-engines, in the use of steam for power; and (*c*) improvements due to the substitution of gas or oil engines or electric motors for steam-engines. His remarks on the last subject, which are those of special interest to our readers, were as follows: In small industries, the small non-condensing engine, taking from 12 lbs. to 15 lbs. of coal per horse power, is rapidly disappearing and giving place to gas or oil engines or else electric motors. The gas-engines are usually worked with town gas, and take from 4½ to 5 lbs. of coal per horse power. The oil engines use no coal. The electric motors are generally supplied from lighting stations. The average cost of coal per unit sold is 0·815d. Assuming the average price of coal to be 10s. per ton, 0·815d. would represent 15·2 lbs. of coal; making the rate of consumption 11·3 lbs. per horse power per hour. This corresponds to 15·2 lbs. per unit. Taking into account the low efficiencies of many of the small electric motors, it does not appear that they are more economical in coal than small steam-engines; on the contrary, their introduction has probably led to increased coal consumption, because they are being put in in many places where power has not been used before. In works, as distinguished from small industries, gas engines are usually worked with producer gas made from anthracite; the average rate of consumption being about 1⅓ lbs. per horse power per hour. These engines probably replace small condensing engines, or non-condensing engines of the better class, using from 4 to 6 lbs. of coal per horse power per hour.

Questioned upon this part of his statement, witness said, with reference to the consumption of coal per horse power in connection with gas-engines, he had ascertained that the average quantity of gas produced from a ton of coal was 10,000 or 11,000 cubic feet; and gas-engines, taking into account all the waste, would use about 22 cubic feet, which worked out to 4½ to 5 lbs. per horse power. As to the 15·2 lbs. of coal for electric motors, this was per unit of electricity sold. He could not say that there was a lack of economy to the consumer in this case. His point was that actually more coal was being used on account of the introduction of electric engines. Passing to the subject of producer gas, witness was asked if it was not a fact that if he had plant requiring 100-horse power, he could use ordinary coal for the purpose of getting his gas. He replied that there were in existence one or two appliances, but that he should not like to put them in himself, from what he could learn of them, even if he required 100-horse power and was going to put up plant with recovery of bye products.

RIVER PLATE GAS COMPANY, LIMITED.

Prosperity of Business in Argentina.

The Annual Meeting of the above Company was held last Wednesday, at River Plate House, Finsbury Circus, E.C.—Mr. A. E. BOWEN in the chair.

The SECRETARY (Mr. Ernest Heald) having read the notice calling the meeting,

The CHAIRMAN said he was very glad that the Directors had again a most satisfactory account to present—indeed, the balance-sheet was by far the best they had had since the formation of the Company some seven years ago; and he believed the shareholders would agree with him in thinking that the undertaking was in a secure and strong position. During the seven years of the Company's existence, they had accumulated a reserve fund of £95,000, had written off out of revenue £25,000 (the cost of the debenture issue and preliminary expenses), and had besides provided ample reserves for any doubtful outstandings. At the last meeting, he was able to say that the long period of depression in the Argentine seemed to be passing away, and that the first few months of 1903 showed a decided improvement in the business of the Company. This view had been very fully borne out. The improvement continued all the year, with the result that while the sales of gas in 1901 fell off by about 5 per cent., with a further fall of 5 per cent. in 1902, in 1903 they recovered 6½ per cent., which the shareholders would no doubt consider was a very good sign. He referred to the vastly improved position of the country; to the fact that new enterprises were being started in every direction; and that the old-established businesses were very prosperous. As the accounts showed, the Company were getting their share of the prosperity. The very large exports of grain helped them, because steamers were glad to go to Buenos Ayres on low freights; and the Company had been able to send out their coal on very favourable conditions. Indeed, the 40,000 tons of coal carbonized last year cost, on an average, 3s. 3d. per ton less than in 1902, showing a very considerable saving. The incandescent lighting business had advanced enormously during the year, until now a very large proportion of the customers used these burners. The Company had also done an extensive business in cookers and heaters. Their customers found that the incandescent mantle gave a better light than electricity, and at considerably less cost. Although the Electricity Company were very enterprising, they only took nine gas consumers away in 1903; whereas they (the Gas Company) added to their list on balance 1578 new house services. The nine losses therefore did not mean much. At the present moment, the Company had nearly 30,000 house services in the city, with more than 30,000 accounts and customers; and, in addition, they lighted more than 7000 street-lamps. The network of mains was extended by about 10½ miles during the year; and so brought it up to the round figure of 400 miles. The difficulties regarding the importation of gas oil, to which he alluded last year, had been overcome; and they were again working their oil-gas plant with very satisfactory results. The yield of gas per ton of coal carbonized and per ton of oil distilled continued to be very good—indeed, the results in 1903 were the best they had ever obtained in the history of the Company; and they reflected great credit on their General Manager and Chief Engineer. All he had said up to now had been favourable to the business; but the Board had had an anxious time during the last six months. The Municipality had brought up a project for starting a very large electric installation for public and also private lighting and power purposes; and simultaneously the Lord Mayor sent to inspect the books of the Gas Companies, and asserted that the Municipality had the right to fix the selling price of the gas. Indeed, he went so far as to issue an order that the price to the private consumers must be reduced from 24 cents to 17 cents per cubic metre. This would mean that the Company would lose money on every foot of gas supplied, and, of course, the shareholders would not get any dividend. But, fortunately, the Municipality had not the power to do all this mischief. The Companies were protected by a formal and binding contract which was made between the Municipality and the Companies in 1896; and the contract still held good. They had lived up to it all through the bad times when business in the country was very depressed, and when it was extremely difficult to make their moderate dividend; so they were entitled to insist upon its maintenance in its integrity now that more prosperous days had come. Their case had been very ably argued before the authorities by the Chairman of the Local Committee (Don Meliton Panelo), who knew more about the gas business in Buenos Ayres than anybody. The matter had been referred to the Municipal Council for settlement; and the Directors were convinced that that eminent Corporation would uphold the contract, especially as Mr. Panelo had assured them that the Company's fixed policy was to increase and consolidate their business by concessions to their customers, whenever the Company could see their way to make them. The Company had proved to the authorities their desire to meet them in every way, because they had nearly always, at their request, carried the gas-mains to the very outskirts of the city—ten miles from the centre and fifteen miles from the works—to sparsely populated districts in many cases. But the Directors had thought it best to meet the wishes of the Municipality, and to give them light, even if it did not pay the Company just at the moment. So that the Company had now spread over the city no less than 400 miles of mains. His own opinion was that this very troublesome and worrying matter would be settled satisfactorily by the Municipal Council; but if it was not, they still had recourse to the Supreme Court, where, he thought, there was not the slightest doubt the contract would be held to be good. As to the accounts, during the year they had only spent £13,500 on up-keep, against £16,400 the previous year. This was because everything had been so well kept up and brought up-to-date since the Company was started, that there was not so much to be done to maintain the works and plant in efficient order. The revenue account showed a profit of £108,105, against £99,617, which was a very satisfactory result for the year. Among other points, he mentioned that the item of London office expenses, &c., was £12,382, against £13,635; the decrease being caused entirely by the difference in income-tax. But, as the shareholders knew, they would have to pay a penny more for the current year. In the balance-sheet, it would be seen that the stocks of coal, &c., stood at £88,192, against £64,459, owing to their having taken advantage of the low freights to increase their stocks of coal. He was pleased to state that the municipal payments were well up to date, so much so that even the amount due for street lighting in December last was paid early in January. Dealing with the appropriation of the balance to the credit of the profit and loss account, the Directors proposed to place a further sum of £25,000 to the reserve fund, raising it to £95,000. In view of what he had already remarked about the pending questions with the Municipality, and although, as he had said, the Board did not think there was any fear of any violation of the contract, it was only prudent to put away as much as they conveniently could in this good year, and until this matter was definitely settled. It did not seem at all likely that the electric project of the Municipality would come to anything, because the Board heard they had made a contract for lighting with the German Company, which was the only Electric Lighting Company in Buenos Ayres. This contract was to extend over some six years; so that it was evident the Intendente had given up the idea of the large electric works which he proposed to put up at a cost of one-and-a-half millions. He moved the adoption of the report.

Mr. A. T. HOOPER seconded the motion.

Mr. B. D. GODLONTON asked what term the contract with the Municipality to which the Chairman had referred had to run.

The CHAIRMAN replied: In perpetuity.

The motion was unanimously carried.

Proposed by the CHAIRMAN, and seconded by Mr. H. G. ANDERSON, a dividend of 8s. per share was declared, making, with the interim payment of 6s., 7 per cent. for the year, free of income-tax.

The retiring Directors (Messrs. A. le Rossignol and C. J. Hegan) and the Auditors (Messrs. Welton, Jones, and Co.) were re-elected.

A vote of thanks was subsequently passed to the Secretary and London staff, to the Chairman and members of the Local Committee, and to the General Manager and Chief Engineer and staff at Buenos Ayres. A like compliment was paid to the Chairman and Directors.

PARIS GAS COMPANY.

Report and Accounts for the Year 1903.

The following is an abstract translation of the report of the Directors of the Paris Gas Company on the working of the undertaking in the year ending Dec. 31, with the principal items in the accounts.

In the twelve months which closed on the above-named date, there were sent from the Company's works 360,987,520 cubic metres, or about 12,743 million cubic feet, of gas, compared with 335,418,788 cubic metres, or about 11,840½ million cubic feet, in the previous year; being an increase of 902½ million cubic feet, against a decrease of 133½ millions in 1902 compared with 1901. The increase last year was, in fact, 7·62 per cent. on the production in the first-named year. In the day consumption, there was an augmentation to the extent of 14,886,260 cubic metres, or close upon 525½ million cubic feet; being equal to 11·7 per cent. of the day output in 1902. The reduction in the price of gas which took place at the beginning of the year is stated by the Directors to be one of the principal causes of this increase in the consumption. Owing to the more general use of cooking and heating stoves, the quantity of gas used in the daytime is now 39·35 per cent. of the total output. The revenue from the sale of gas amounted to 96,592,733 frs. (£3,863,710), or 7,845,909 frs. (£313,836) more than in 1902. Of the total receipts for gas, 88,050,240 frs. came from the city, and 8,542,493 frs. from the surrounding districts. The consumers at the close of the year numbered 596,986, compared with 491,193 at the end of 1902. They were divided into two classes: Ordinary, 321,870; and "free-fitting," 205,116. In the preceding year, the numbers were 308,806 and 182,387. There was consequently an increase of 13,064 in the former and 22,729 in the latter class, or a total of 35,793, against 17,537 for the year 1902.

The number of burners in the public lamps at the end of last December was 66,569, of which 53 881 were employed in lighting the city and 12,688 were in use in the suburbs; being an increase of 350 and 17 respectively, or 367 in all. Further progress was made during the year in substituting incandescent for ordinary burners. The extent to which the different kinds are used is shown in the following table:—

Kind of Burner.	1902.	1903.	Inc.	Dec.
Ordinary	3,297	2,969	—	328
Auer	46,136	46,466	330	—
Denayrouze	2,934	3,345	411	—
St. Paul	1,095	1,029	—	66
Regenerative	69	72	3	—
Total	53,531	53,881	744	394

The number of rising mains laid on last year was 1050; bringing up the total to 52,110. The consumers served from them at the close of the year numbered 382,008, or 33,988 more than at the corresponding time in 1902, in which year the increase was only 15,503. The proportion of consumers supplied in this way is 72·49 per cent. of the total; whereas at the end of 1902 it was 70·85 per cent.

With regard to the works and plant, the distributing system was extended by about 10,197 yards—9671 yards in the city and 526 yards in the suburbs. These additions brought up the total length of mains in December last to 2,798,164 yards—1,848,870 yards within, and 949,294 yards beyond the city. The installation of machinery for charging and discharging retorts, referred to in the report for 1902, has been completed and put in operation at one of the stations, with highly satisfactory results. The Company are now in a position to extend it to their other works. There was a net sum of 2,639,507 frs. (£105,580) expended for capital purposes last year; and at the close the account stood as follows:—

	Francs.	Sterling.
Amount expended to Dec. 31, 1902	335,630,523	£13,425,221
,, ,, during 1903	2,639,507	105,580
Total	338,270,030	£13,530,801

To meet this there has been raised: By shares, 84,000,000 frs.; by bonds, 254,004,189 frs.—together, 338,004,189 frs. To this total must be added a sum of 2,246,799 frs. taken from the revenue in 1900 to meet capital expenditure in excess of 3,200,000 frs.; making in all 340,250,988 frs. (£13,610,039). There is consequently an unexpended balance of 1,980,959 frs. (£79 238). The capital is represented by 336,000 shares and 553,332 bonds. At the date of the report, there had been redeemed 297,417 shares and 473,122 bonds; so that 38,583 shares and 80,210 bonds remain for redemption.

The following is the working account for the past year:—

Expenditure.

	Francs.	Sterling.
Value of gas in store on Jan. 1, 1903	64,029	£2,561
Manufacture of gas—		
Carbonizing material	24,276,139	971,046
Coke and tar for heating purposes	5,120,437	204,817
Salaries and wages	5,371,078	214,843
Maintenance of works and plant	1,909,935	76,397
Incidental expenses of carbonization	1,329,535	53,182
Purifying materials and labour	412,904	16,516
Distribution—		
Salaries of Engineers and officers	2,699,490	107,980
Repairs, &c., of mains and services	2,197,928	87,917
Miscellaneous expenses, stamps, &c.	554,968	22,199
Gratuitous installations of fittings, &c.	797,511	31,900
General management (including interest and sinking fund payments)	26,493,690	1,059,748
Pension and provident funds	2,086,889	83,475
Municipal charges—		
Tax of 2 c. per cub. met. of gas sold	6,280,791	251,232
Rent of subsoil occupied by mains, &c.	200,000	8,000
Lighting, extinguishing, and maintenance of public lamps (less amount paid by Municipality)	1,392,764	55,711
State charges—		
Official gas testing, stamps, &c.	1,217,836	48,713
Total expenditure	82,405,924	£3,296,237

Revenue.

	Francs.	Sterling.
Value of gas in store on Dec. 31, 1903	71,857	£2,874
Sale of gas	96,592,733	3,863,710
Residual products—		
Coke	17,161,401	686,456
Tar	2,376,301	95,052
Ammoniacal liquor	2,353,603	94,144
Rental of meters and fittings on hire	3,229,504	129,180
Interest and discount	1,290,231	51,609
Fire-bricks, &c.	4,230	169
Total revenue	123,079,869	£4,923,194
Deduct expenditure	82,405,924	3,296,237
Balance, profit for 1903	40,673,936	£1,626,957
Add balance from 1902	369,638	14,786
	41,043,574	£1,641,743
Deduct to meet outstanding claims	543,574	21,743
Balance available for distribution	40,500,000	£1,620,000
Deduct for share dividend	11,200,000	448,000
Balance, divisible equally between the Company and the Municipality	29,300,000	£1,172,000

The total amount coming to the shareholders is therefore—

	Francs.	Sterling.
Dividend as above	11,200,000	£448,000
Half of divisible balance	14,650,000	586,000
Placed to shareholders' credit, as per resolution of March 23, 1875	50,000	2,000
Balance of undivided profits	162,749	6,510
Total	26,062,749	£1,042,510
Deduct 1 fr. per share for reserve fund (336,000 frs.) and the complement of the share redemption fund ordered by the State Council to be borne by the shareholders (3,493,792 frs.)	3,829,792	153,192
Balance	22,232,957	£889,318
Deduct interim dividend of 12 frs. 50 c. per share paid in October last	706,350	28,254
Balance	21,526,607	£861,064

This allowed of the payment of a final dividend of 63 frs. per share, making 75 frs. 50c. for the year; leaving a balance of 358,607 frs. (£14,344) to be carried forward. The dividend was 10 frs. 50c. per share higher than that declared last year, which was 1 fr. more than in 1901. In fact, this is the highest dividend paid since the year of the Exhibition in 1889, when it reached 78 per cent. In 1898, when a decree of the State Council caused a considerable reduction in the profits, it was only 49 frs. Since then, however, it has steadily risen.

Following the accounts is the portion of the report dealing with the residual products and the gas-stove business. The revenue from the sale of coke, as already shown, was 17,161,401 frs., which was 269,800 frs. (£10,792) more than in 1902. This increase makes up, to a slight extent, the large falling off in that year, as compared with 1901, owing to the mild weather. There was also a satisfactory improvement in the tar and chemical products, which yielded 1,372,762 frs. (£54,910) more than in the preceding year. There were a considerable number of visitors to the Company's show-rooms during the twelve months. This was, indeed, only to be expected, as the reduction made in the price of gas, already referred to, led to its still more extended adoption for domestic purposes. Orders were received for 5378 heating and cooking appliances. Gas was also in increased demand for motive power—136 engines having been added to the number supplied by the Company; bringing up the total to 3663, furnishing altogether 16,800-horse power. The quantity of gas consumed in this way last year was about 450½ million cubic feet, or rather more than 50¾ millions in excess of the consumption in 1902.

As usual, particulars are furnished in the report in regard to the provident, pension, and savings funds. Last year the expenses of the provident fund amounted to 534,374 frs. (£21,375), whereas the receipts were only 426,387 frs. (£17,055); leaving a deficiency of 107,987 frs. (£4320), which was charged to the working account for the year. There are two pension funds—one for the workmen and the other for the clerks, &c. The amount of the former on Dec. 31 was 1,448,603 frs. (£57,944), and of the latter 14,704,219 frs. (£588,169). Portions of each of these funds are invested in the Company's shares and bonds. The balance of the savings fund at the close of the year was 308,548 frs. (£12,342).

The remainder of the report is devoted to a review of the proceedings in connection with the control of the gas supply at the close of the Company's concession, and an explanation of the project for continuing the supply in the suburban communes. With regard to the former subject, the Directors submitted to the Municipal Council a scheme under which, on condition that the concession was extended for twenty years, the price of gas would be successively reduced from 20c. to 18c. and finally to 16c. per cubic metre. The Municipality were to be guaranteed 17,000,000 frs. out of the profits, and half of those over 18,000,000 frs. up to 28,000,000 frs., above which sum they were to have two-thirds. In addition, they were to take possession of the plant and works at the expiration of the concession. These terms were not considered good enough; and accordingly, at the meeting of the Council on the 3rd of July, it was decided that gas should be supplied under municipal control, and a loan of 100,000,000 frs. was voted to meet the reduction in the price and the increase in the salaries and wages in the interval between Jan. 1, 1903, and Dec. 31, 1905. The Bill to authorize this loan was passed by the Chamber of Deputies on Jan. 21 last, and has since been approved by the Senate. Before the Municipality can take the management of the gas business, however, certain alterations will have to be made in existing legislation affecting public accounts. The Prefect of the Seine has therefore had to prepare a scheme to enable this to be carried out. He

also submitted to the Minister of the Interior early in the year a plan for the organization of the municipal management of the gas undertaking. It was returned to him with the suggestion that a Bill should be prepared dealing generally with both financial and administrative matters. This was done, and the amount of the loan was put at 153,000,000 frs., which could be reduced to 138,000,000 frs. by deferring certain works; the period for redemption being fixed at 35 years. A special meeting of the Municipal Council was called to consider this proposal, with the result that the loan was reduced to 120,000,000 frs., repayable in 75 years. The Bill, thus amended, was sent to the Chamber of Deputies. There, for the present, the matter rests.

On the subject of the supply of gas to the suburban communes, the report sets forth that, in view of the dilatoriness of the City in coming to a decision on the gas question, a number of the communal authorities had a conference, the outcome of which was the acceptance of an offer by a new Company, formed for the supply of gas for lighting, heating, and motive power, to undertake the service of the communes from Jan. 1, 1906. This arrangement was sanctioned by the Prefect of the Seine on the 30th of January last. One of the conditions was a reduction of 10c. per cubic metre in the price of gas to private consumers as from the beginning of the current year. This, of course, could not be done without the consent of the Paris Gas Company, whose concession allows them to charge 30c. It was given, however, on the new Company agreeing to indemnify the older one for their loss. It was accordingly decided that the Suburban Company should pay a sum equal to the total amount of the reductions for the two years 1904 and 1905, but not to exceed 4,700,000 frs. The sanction of the Prefect of the Seine was not given unconditionally. He was careful to stipulate that the reduced revenue which would result from the alteration in the price must not be allowed to affect the amount to be paid to the City as their share of the profits. The Municipal Exchequer is not to be made a sufferer by the arrangement. With regard to plant, the Suburban Company will pay the Paris Gas Company for all rising mains, service-pipes, and meters put in, as well as for all extensions of the street-mains called for by increased consumption during the two years. In order that the shareholders in the older Company may have a direct interest in the new one, they have been granted the prior right to subscribe for one-third of all the shares to be issued before Jan. 1, 1906; and they have availed themselves of it to the extent of one-third of the present capital of 25,000,000 frs. These shareholders will be represented on the Board of the new Company by two of the Directors of the Paris Company.

COLONIAL GAS UNDERTAKINGS.

In previous issues of the "JOURNAL" notices have appeared of the progress of the two principal Australian gas undertakings—those at Melbourne and Sydney. Reports have lately reached us in regard to some smaller companies; and we take from them the following particulars: In the six months ending Dec. 31 last, the Brisbane Gas Company had a revenue of £22,622 from the sale of gas, &c.; and after meeting expenses and placing £1875 to the general reserve and £1000 to the reserve for the railway siding, they had a balance of £12,146 for distribution. This was disposed of by paying a dividend of 5 per cent., amounting to £7000; a bonus of 9d. per share, £1050; and the dividend tax, £402—leaving £3694 to be carried forward. The Maryborough (Queensland) Gas Company had a balance of £1010 as the result of the working in the latter half of the past year; and out of it they paid a dividend at the rate of 6 per cent. per annum, and carried £239 forward. The North Shore (Sydney) Gas Company had a net profit, after allowing for reserve and depreciation, of £4993 as the result of the six months' working to Dec. 31 last. This was brought up to £5055 by the addition of the amount left over, and out of it the Directors paid a dividend of 3½ per cent. and a bonus of ½ per cent., free of income-tax. This took £4997, and left £58 to be carried forward. The Wellington (New Zealand) Gas Company had last year a revenue of £53,924 from the sale of gas, coke, &c., and an expenditure on manufacture, distribution, &c., of £40,510. There was a balance of £15,965; and a dividend of 10s. per share was declared, making with the 10s. paid in July a total of £1 per share.

GAS, ELECTRICITY, AND WATER AT ROCHDALE.

The report presented to the Gas and Electricity Committee of the Rochdale Corporation shows that the net profit on the twelve months' working was £14,826, as compared with £18,359 in the previous year—or a decrease of £3533. The total receipts, were £82,452, or £6100 less; gas-rental exhibiting a reduction of £8000, but coke an increase of £2000. Of the drop in the receipts for gas, one-fourth is put down to decreased consumption (due mainly to the short time worked in the mills during the autumn and winter), and the remainder to the reduction in the price for lighting purposes. Since June, consumers for lighting have been paying 4d. per 1000 cubic feet less than before—that is, 2s. 10d., instead of 3s. 2d. The expenses of the department have been £2567 less than in the previous twelve months; the figures being £67,626, against £70,193. The Committee have decided to devote £13,000 of the profits to the relief of the rates. This is £141 more than a year ago, when £12,859 was allocated to the purpose. The Committee propose to place the balance of about £1800 to the reserve fund. Twelve months ago, this fund stood at £21,275; but over £1000 has been spent during the year. With the sum proposed to be added, the fund will total nearly £22,000; this money having been accumulated for the purpose of building a new retort-house, which will cost about £25,000.

For the first time since they were opened, the electricity works show a profit; the receipts for the year having amounted to £7542, against £4330, or an increase of £3212. Of this, however, £2500 was paid by the Tramways Committee, who are supplied practically at cost price. Expenses have, of course, risen with the greater turnover; but the increase is less than £1000, and the net result is a surplus of £622. This amount is to carried forward. Twelve months ago, the department showed a deficit of £1492; and in 1902, one of £2385.

The water-works report does not constitute such cheerful reading as those relating to gas and electricity. It may be that it is better than was expected; but still the deficit on the whole of the works (Todmorden included) was £5861, or £380 more than at the end of the last financial year. Supplies for trade showed an increase of £157; and those for domestic purposes were £613 more. On the other hand, however, the expenses were considerably heavier; the increased dearness of money having added no less than £1229 to the interest on loans during the year, while the item of rates was £600 more. For the past four years there has been an annual payment of £1880 towards the cost of the Act of 1898. These costs amounted to about £9500; and the Corporation were allowed five years in which to pay them. The last payment will be made in the current year, and this item will then disappear; but by March 31 next it is expected that the Todmorden Corporation will have completed their new water-works at Gorpley, and will be in a position to serve their own district, which is now supplied by Rochdale. If so, this loss of revenue will counterbalance the £1880 referred to. It is anticipated that as the Ramsden water gradually comes into use in the Rochdale area of supply, this matter will more than right itself; for while the Corporation can charge only 7½ per cent. on the rental at Todmorden, the rate in Rochdale is 10 per cent. On the old works, the deficit in the present accounts is about £698, against £85 twelve months ago. The remaining amount (£5162) was incurred on the Todmorden portion of the undertaking. To clear off the total deficiency will require a rate of 4d. in the pound.

BLACKPOOL CORPORATION GAS SUPPLY.

Another Successful Year.

At the Meeting of the Gas Committee of the Blackpool Corporation on Monday last week, the gratifying news was conveyed to them by the Engineer and Manager (Mr. John Chew) that the results of the working of the gas undertaking in the past financial year have exceeded the most sanguine expectations. The aggregate receipts amounted to £81,131; while the expenditure was £52,812—showing a gross profit of £28,319. After deducting interest and sinking fund charges, there will remain a net profit of £17,000. From this probably £2000 will be taken for the special reserve; but then there will be left £15,000—a good round sum. Commenting upon the excellent showing presented by the gas undertaking, a local paper says "such a magnificent result does the veteran Gas Manager and his son, Mr. W. Chew, the Assistant Gas Engineer, infinite credit. It can only have been accomplished by most careful management." Bearing in mind the fact that the price of gas in Blackpool is only 2s. 4d. per 1000 cubic feet, it speaks volumes for the productiveness of the undertaking when it is mentioned that within the last six years it has contributed no less than £75,000 to the relief of local taxation. The outlook at the commencement of the year was anything but promising. A large customer had been lost in the Lytham and St. Annes Tramway Company, who had discarded gas traction in favour of electricity; the revenue from the public lighting of the town had also been reduced £800; and trade generally was depressed. Yet, in spite of these disadvantages, Mr. Chew finished the year with his department in a more flourishing condition than ever. Although the supply of gas for street lighting is some 10 million cubic feet less, the manufacture of gas has risen from 450 million to 471 million cubic feet. The explanation of the large profits made in the past year is found in the fact that better prices were obtained for residuals; the sale of tar alone having realized an extra £2000, while the sale of coke and coal (the latter supplied to other municipal departments) also brought in an additional £2400.

Referring again to the public lighting, a meeting of the Markets and Street Lighting Committee was held a few days ago, when the estimates for the ensuing twelve months were discussed. Mr. Chew's estimate for gas for public lighting was £5300, and the electric lighting was put down at £4945. This is about £400 less than last year; but though the total has been reduced from £11,903 in 1902 to £10,245 for the coming year, it was felt that as compared with other seaside resorts the expenditure on street lighting at Blackpool is still very high, and a Sub-Committee was appointed to go into the question. It was reported that a considerable saving has been effected by the substitution of incandescent gas light for electricity. In the case of the market alone, the cost of lighting has been reduced from £75 to £25 a year, and the trial has proved so successful that the use of incandescent gas lighting is to be still further developed.

Electric Lighting Scheme at Carnarvon.—The Carnarvon Corporation are applying to the Local Government Board for sanction to borrow £17,000 to carry out an electric lighting scheme. The Corporation some time ago obtained a Provisional Order, and entered into a conditional agreement with the National Construction Company to carry out the work. According to the terms of this agreement, the Corporation were to obtain a loan of £17,000, in respect of which the Company would pay £1020 a year for interest and sinking fund; and there was also 3 per cent. which the Company, under certain conditions, were to reserve to themselves, representing £510 a year. If the undertaking was not a success, then no loss would fall upon the town during 25 years, at the end of which time it must take over the works; while if the concern proved a success, the Corporation would have the option of taking it over at the end of 10, 15, or 20 years. If the receipts were more than £1530 a year, the Corporation would get whatever surplus there was. The Company would have to maintain the plant in perfect repair. When a rival scheme came upon the scene, the Company agreed to have the two submitted to the opinion of an independent expert, and to abide by his decision. The expert reported favourably upon the soundness of the National Construction Company's scheme; but, in spite of this fact, the proposal has aroused considerable opposition.

INCANDESCENT GAS LIGHTING IN EDINBURGH.

Amended Scheme Adopted.

A Meeting of the Edinburgh Town Council has been held to dispose of the business which was not overtaken on the previous occasion, when the Council was counted out in the midst of a discussion upon the proposal to light the streets by means of incandescent gas-lamps (*ante*, p. 178). The Cleaning and Lighting Committee had modified their scheme from the lighting of the whole city to the lighting of one-fifth part of it in the course of next year.

Treasurer BROWN seconded the amendment moved by Mr. Macpherson, approving generally of the principle involved, but recommitting the report for further consideration as to whether the alteration could not be made without any annual increase on the rates. What, he said, he contended for on a previous occasion was that they ought to fix upon the policy which the Town Council were going to adopt in regard to the whole question of the lighting of the city. At present there was no definite policy before them. They were decidedly at one that something required to be done, but that it should not be done hurriedly. Therefore, he thought this recommendation ought to go back, even though a twelve months' delay was involved. For financial reasons, they should pause and make further inquiries. They were told on authority that they were only getting 45 per cent. of the possible illumination at present, and that with a change of lantern they could get 75 per cent., without using any more gas. Then he thought the Town Council might very well have expected much more handsome treatment from the Gas Commissioners than they were apparently to receive. The price of gas was an element which they ought to consider; and he thought they were entitled to get gas from the Gas Commissioners at cost price for street lighting. When they were offered gas at 2s. per 1000 cubic feet for incandescent lighting, they were surely not requiring too much when they asked to be supplied with all the gas needed for public lighting at 2s. per 1000 cubic feet. Dealing with the financial aspect of the question, he pointed out that, leaving the stair lighting out of account, the amount spent on public lighting had increased by 79 per cent. in the last decade. Ten years ago the total net expenditure was £16,498; last year (1902-1903) it was £40,186, an increase of £23,688. In the year 1892-1893, the cost to the ratepayers was 2¼d. in the pound on the assessable rental, and 1s. 5d. per head of the population. Last year the figures were 3¾d. and 2s. 5½d. It was quite true that during the two periods the electric light had been introduced largely into the street lighting, and that £8801 had been paid for gas supplied for stair lighting. But if a sum of £10,568, as the total expense applicable to this lighting, was deducted from the £40,186, it left £29,618, or about 79½ per cent., added for street lighting within the city within ten years. The length of streets lighted by electric lamps was 34 miles; by incandescent gas-lamps, 5 miles; by ordinary gas-lamps, 139·15 miles; or a total of 178·15 miles. Some 9 miles were unlighted. The average cost per mile for the 178·15 miles was £166. For comparison with other cities, however, it was fairer to take the lighting by gas only, which, deducting the total charge for lighting by electric current—£11,399—amounted to £18,219, as the total cost of lighting 144·15 miles, or an average of £126 per mile. For the gas only, the Council paid £10,371 to the Commissioners, or an average of £71 19s. per mile. How did these figures compare with other cities? In Liverpool, which some had declared to be the best-lit city in Europe, the cost per mile for gas alone was £48 15s. 3d., or 67 per cent. less than in Edinburgh; in Aberdeen, £40; in Glasgow, £69; and in Dundee, £74. In regard to illuminating power, certainly the Commissioners did not supply 25-candle gas. In Liverpool it was 20-candle gas, tested at various places independently of the Gas Company, and found to show no variation compared with the works. In Aberdeen, the illuminating power was 23 or 24 candles; in Glasgow and Dundee, 20 candles; and in Leeds and Bradford, 18 candles. The cost per 1000 feet was in Edinburgh 2s. 5d.; in Liverpool, 2s. 8d., less 10 per cent.; and in Glasgow, 2s. 1d. He contended that he had made out a case for further inquiry. The citizens had borne with bad gas, or at any rate with bad lighting; and were they to be forced to go forward and spend thousands of pounds without an inquiry why the city was paying more, both for the gas itself and also for maintenance, than the other places he had named?

The LORD PROVOST explained that the recommendation of the Committee—that 20 per cent. of the gas-lamps should be converted to the incandescent system—was not intended to commit the Council to undertaking the alteration of the remainder of the lamps in subsequent years. After the experiment had been made, the Council would see the result, and decide their future policy accordingly.

Sir A. M'DONALD expressed regret at the antagonistic tone of the Treasurer's speech towards the Gas Department, the relations of which with the Electricity Department had hitherto been so harmonious. He was quite willing to go into the question of the quality and illuminating power of the gas if this were relevant, including the lighting of stairs. But so long as Mr. Falconer King certified that the gas at the works was of the standard required by Act of Parliament, what could the Council do? He attached no importance to the figures of mileage, as they all depended on the closeness of the lamps. The Treasurer, while giving the percentage of increase of cost, had not reminded the Council that the size of the city had enlarged by 46 per cent. at one time, and had been considerably added to since.

Mr. MACKENZIE moved, as a further amendment, that the whole matter of improved street lighting be remitted back to the Cleaning and Lighting Committee and the Electric Lighting Committee combined, with the view of considering what streets, if any, could be suitably and economically lighted with electric arc lamps, as well as what streets should be lighted with incandescent gas lamps.

Bailie CAMERON seconded the amendment.

Mr. MENZIES defended the quality of the gas supplied to the city, and argued that the public should not place any reliance on the figures

PURIFIERS

WITH

WATER LUTES, OR LUTELESS,

FITTED WITH

STEEL COVERS

SPECIAL INDIA-RUBBER JOINTS.

ABSOLUTELY GAS TIGHT.

WRITE FOR FULL PARTICULARS TO

C. & W. WALKER, LTD.,

Midland Iron Works: DONNINGTON, near NEWPORT, SALOP.

London Office: 110, CANNON STREET, E.C.

obtained by the photometer used at the University, as the Commissioners' Engineer (Mr. W. R. Herring), notwithstanding every effort made, had failed to obtain access to the apparatus.

After some further conversation, the two amendments were withdrawn.

The Lord Provost thereupon announced that it had been carried unanimously that one-fifth of the city should be lighted by incandescent gas as an experiment.

THE MARYLEBONE ELECTRIC LIGHTING QUESTION.

The Company's Proposals Rejected.

At the Meeting of the Marylebone Borough Council on Thursday—the Mayor (Rev. H. Russell Wakefield) in the chair—certain proposals made to the Council by the Metropolitan Electric Supply Company, and the report of the Electric Supply Committee, thereon were under discussion.

The Mayor said the Council had gone step by step with the Company till they had to ask for the final proposals which they had to make, because it was perfectly obvious that if they were to have the undertaking in their own hands, the sooner they got to work the better it would be for them. There were two definite proposals which the Company had made—one that they should supply current in bulk (and, of the two proposals, this was not the one which commended itself to the delegates, for it would be a complicated matter which might cause continual friction), and the other that the Council should lease the undertaking to the Company, in which case the costs which the latter would refund to the Council would be about £10,000. On this proposal coming to them in this way, the delegates had written to the Company asking whether it was absolutely their final decision to insist upon a terminable lease and upon the non-capitalization of the costs of the arbitration. The delegates said they could not do otherwise than oppose on the Council the acceptance of the suggestions, unless the leases were non-determinable and the costs were capitalized. The Company replied that they were unable to alter their views on the two points mentioned.

Mr. E. R. Debenham, the Chairman of the Electric Supply Committee, moved a recommendation from them that the Council should resolve that the proposals of the Company be not accepted, and that the Council should order the Committee to proceed, with as little delay as possible, to have the necessary plans and specifications prepared to carry out the resolution of March 12, 1903, to authorize the expenditure during "the next two years" of £400,000, exclusive of the cost of site, for the purpose of erecting a generating station and purchasing the necessary plant and machinery, and for finishing the conversion to a continuous-current supply of the districts not yet completed by the Company, provided that the sum could be raised by loan. He said that the Council would remember that his Committee undertook, before the poll of the borough was taken, to ascertain whether favourable terms could be obtained, either from the Metropolitan Company or from some other, to lease the undertaking. In order that this might be effected, they embodied in their Bill a clause which they were advised would give them power to do this; but the House of Commons Committee had thrown it out. It would be practically impossible to get a fresh Bill through on the initiative of the Council this session; it could only be done if they had come to terms with the Metropolitan Company, and they had promoted such a Bill themselves with the consent of the Council. If this Bill had been unopposed, it might have passed. But it certainly would have been opposed; and, therefore, even if favourable terms for a lease had been offered by the Metropolitan Company, the Council would have continued in a further state of uncertainty for another year. As a matter of fact, however, favourable terms had not been proposed by the Company; and his Committee had never thought it possible that they could be. The Council had in their stoneyard site a cheap area for a station, and one that had equally good coal facilities with Willesden; for they had both a canal and a railway. They had also the opportunity of installing the most modern and economical plant; and therefore the original generation of current should cost less at their own stoneyard site than with the Metropolitan Company at Willesden. But to supply current from a station 4½ miles off meant a considerable loss of efficiency. Consequently, supposing the cost of generation to be the same at Willesden and at the stoneyard site, there was bound to be an advantage of something like 25 per cent. in favour of the self-contained supply. Therefore, whatever terms the Metropolitan Company had offered, the Council could have done better themselves. They were now in the position of having got practically everything they asked—that was to say, they had obtained from Parliament a period for their loan of 38 instead of 42 years, which only made a small difference in their results. They had been allowed to suspend the sinking fund for three years; and, though it would result in a very small loss during the first years, it was extremely unlikely that this loss would have to be borne by the ratepayers, and in following years it put less burden upon the Council than their own proposals in the original Bill. They had obtained a promise from the London County Council to furnish them with funds as soon as their own Money Bill passed; and they had every reason to suppose that the charge for interest would at any rate not be more than they had estimated in their tables. They had every reason to believe that the profits, as estimated by Mr. Wright, would be made, and more. He could not believe that the Council were going to make themselves supremely ridiculous, now that they had obtained all they wanted, by having any doubt about carrying on the undertaking themselves. He could only hope that those opponents in the Council who had made things so difficult during the last six months, would now give them their help, and co-operate in making the undertaking that they had acquired the brilliant success which he was absolutely convinced it would be.

Alderman G. J. Elgood, the ex-Mayor, seconded the proposition which was carried by 49 votes; only one dissentient vote being given.

GUNNING'S (PATENT) APPARATUS FOR

AUTOMATICALLY LIGHTING AND EXTINGUISHING STREET-LAMPS AT PREDETERMINED TIMES

Have been adopted either for *all the Public Lamps* or *for whole Districts* at:

WEST HARTLEPOOL,
NEWCASTLE-ON-TYNE,
BISHOPS STORTFORD,
BARNARD CASTLE,
GLASTONBURY,
HUYTON,
PONTYPRIDD,
FOLKESTONE,
EAST COWES,
NEATH,
BRIGHTON,
DOVER,
SALISBURY,
BOURNEMOUTH,
ENFIELD, &c.

After prolonged successful trials, which conclusively proved the system to be **reliable, simple,** and of **great economizing value.**

Particulars of savings effected in Labour, Gas, and Mantles, and terms of **Purchase, Hire Purchase, Hiring Contracts**, and **free trials** supplied on application to:

THE
AUTOMATIC LIGHT CONTROLLING CO., LD.,
39, VICTORIA ST., WESTMINSTER, S.W.

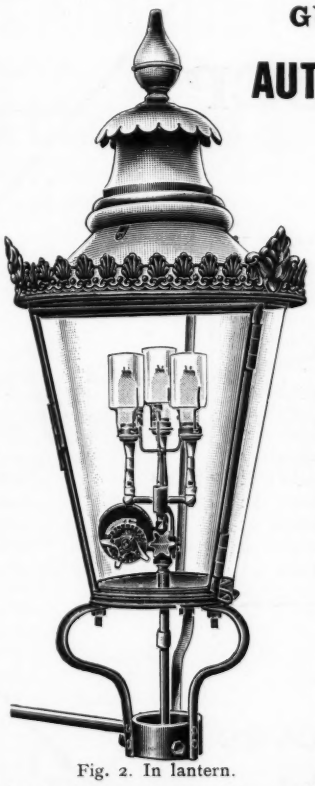


Fig. 2. In lantern.
Automatically operates cluster of burners with midnight arrangement at required hours daily for one week with one setting.
Adaptable to any number or kind of burners.

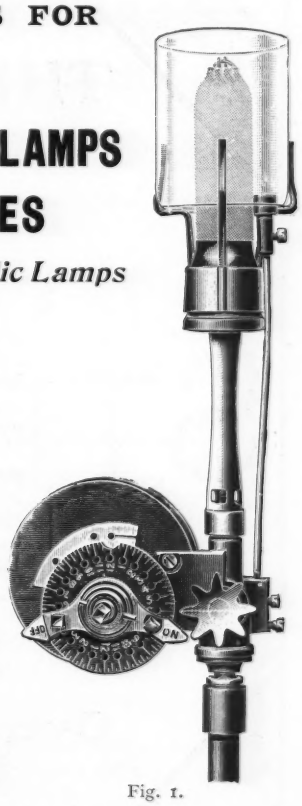


Fig. 1.
Automatically lights and extinguishes a single burner at the required hours daily for one week with one setting.
Adaptable to any kind of burner.

GAS AND ELECTRICITY SUPPLY IN ROME.

According to the report of the Directors of the Anglo-Romano Gas Company on the working in the past year, which was presented to the proprietors at the recent annual meeting, the quantity of gas sold was 18,301,838 cubic metres, or about 646 million cubic feet. Of this, the private consumers took 13,845,337 cubic metres, and the municipal authorities 4,456,501 cubic metres. Compared with 1902, there was an increase of about 7½ per cent. Something like a million cubic metres of gas were employed for heating purposes, and a like quantity for motive power. For the public lighting of the city, 9191 burners were in use on Dec. 31 last. At the same date there were at work 20,966 meters, representing 150,942 burners; being an increase of 1434 meters and 6900 burners compared with the previous year. The gas-engines in operation numbered 210, giving 994·5-horse power. The length of new mains laid was 11,093 metres, or about 12,200 yards; so that the total length is now 244,904 metres, or close upon 269,400 yards. The number of new services laid was 1967; of house fittings, 1433. There were 377 installations of prepayment meters; and 306 rising mains were fixed. On Dec. 31 last there were altogether 16,389 services, 8146 house fittings, 2402 prepayment meter installations, and 1576 rising mains.

With regard to finances, the profit and loss account for the year showed a credit balance of 2,184,160 lire (£87,366). The reserve fund, which was 3,727,144 lire, now amounts to 3,875,378 lire. With the interim dividend paid in October, the shareholders will receive 70 lire for last year on each share, the nominal value of which is 500 lire.

In the electricity supply branch of the Company's business there was similar progress last year, as the following figures of the quantity of current sold show:—

	Kilowatts.	Difference Compared with 1902.
Lighting	3,676,004	.. 615,177 increase.
Traction	3,457,481	.. 589,216 ,,
Power	4,462,132	.. 1,547,523 ,,
Heating	6,351	.. 1,029 decrease.
Total	11,601,968	.. 2,750,887 increase,

or about 31 per cent. more than during the previous year. More than half this was due to the sale of current for motive power, resulting from contracts made for the most part in 1902. During the past year, 328 motors were fitted up in 160 establishments, furnishing 2412½-horse power; the increase, compared with the previous year, being 76 motors and 556-horse power. The number of arc lamps installed was 1336, and of incandescent lamps 170,709—making a total of 172,045 lamps, equivalent to 170,113 lamps of 16 candle power; the increase compared with 1902 being 21,993 lamps. There were 676 transformers and 3359 meters working; being an increase of 71 transformers and 506 meters. The length of conductors was increased by 15,915 metres at high potential, and 1253 metres at low potential—together, 17,168 metres, or close upon 19,000 yards. The street cables now measure 137,920 metres high potential and 55,068 metres low potential—total, 192,988 metres, or about 212,000 yards.

INTERFERING COUNCILLORS AND CORPORATION OFFICIALS.

Mr. Gilbert Little, who at the late municipal elections was chosen as a member of the Smethwick Town Council, recently entertained the members of his Committee and canvassers at dinner at the Victoria Hotel, Soho, Smethwick. The company numbered about seventy, many of whom were skilled artisans who had worked most enthusiastically for Mr. Little, and gained him his huge majority. One of the toasts was "The Borough Officials;" and speaking to it, Mr. Little said he was glad he could state that Smethwick had an exceptionally able staff of officials. For results, whether good or bad, in management, there were always reasons. In a great many towns in England, men who were altogether wanting in knowledge that could be of the slightest use in connection with the management of gas or electricity works, or with any technical subject, were elected on the town council. These men usually, immediately after their election, proceeded to pester the skilled officials, as if they thought their first duty as councillors was to find out, or imagine, causes of complaint. Wherever there was a preponderance of this type of councillor, the results obtained were, as a rule, bad, or far below the average; and he did not hesitate to say that the reason was the ignorant interference, at every turn, of these municipal mountebanks with the well thought-out proposals of the skilled officials. No man, however great his ability or wide his experience, could possibly devote it to the best advantage of the ratepayers (his real employers) if dispirited by the senseless carping of the class of councillor he had depicted—a class now far too numerous. In town councils where there was a majority of such men, the officials were generally underpaid; and it was pitiful to see councillors of the small shopkeeper type, instead of advocating liberal payment, doing their best to keep the salaries at little above the remuneration of one of their vanmen. He attributed the highly successful management of the affairs of Smethwick by the Corporation officials to the fact that the majority of the members of the Town Council were practical engineers, manufacturers, coal or iron masters, sensible shopkeepers, and fair-minded, skilled working men, who could, and did, appreciate that successful economy was only possible under well-paid supervision. So long as he occupied a seat on the Council, the first plank in his "platform" would be: "Pay the skilled and deserving Corporation officials the highest price for their

THE CHIMNEY SWEEP!

A Declining Calling.

The chimney-sweep is beginning to suffer from the growing preference for gas-stoves and other means of heating in place of coal fires. Representatives of the calling at Henley-on-Thames have given notice that, owing to the depression of trade, they have agreed "to sweep no chimneys under sixpence, and not less than a shilling for tradespeople." It is likely that a century hence the chimney-sweep will be as extinct as are to-day the climbing-boy and the tinder-box of a century ago, and his brush and rods will repose among the interesting relics of bygone practices in museums. A consummation devoutly to be wished, as it more or less implies the suppression of "the nuisance of the smoke of London."—*Westminster Gazette.*

Over 100,000 Richmond Stoves in use in London alone!!

Advertisement of The Richmond Gas Stove and Meter Company, Ltd., Stratford and Warrington.

services." He would couple the toast with the name of Mr. Vincent Hughes, the Corporation Gas Engineer and Manager. Since Mr. Hughes came among them, he had fully justified all their expectations of him as an efficient carbonizer; and the results of his management had been so satisfactory that if they paid him according thereto they would owe him a very substantial increase of salary. Mr. Hughes, in responding, said it was always a treat to meet Mr. Little in any capacity, particularly as a cheery companion. He felt very gratified at being spoken about in such encouraging terms by one who was so qualified as their host to appreciate the best results in modern carbonizing work. As a rule, gas managers got more kicks than halfpence, from the ratepayers in general and the members of the Gas Committee in particular. His lines had fallen in more pleasant places in Smethwick, as complaints were as rare as dry days last summer. This happy state of affairs could be accounted for by having a Committee of which all the members were practical men. If many of his brother engineers had the like good fortune, they would not be subjected to continual disheartening, ignorant criticism from their committees, and unintelligent complaints from stupid consumers.

METROPOLITAN WATER BOARD.

Management of Stock—Water Companies' Costs—Arbitration Proceedings.

A Meeting of the Board was held on Friday, at the offices of the Metropolitan Asylums Board—Mr. R. M. Beachcroft in the chair.

The first business was the appointment of a Vice-Chairman; and Mr. John Glass, the representative of the Stoke Newington Borough Council, was elected.

The Finance Committee presented a report dealing with the issue and management of water stock and the banking arrangements of the Board, and recommended as follows: "That the chief account of the Board be kept at the Bank of England, a minimum balance being maintained of £10,000; that the issue and management of the stock be entrusted to the Bank of England, and that the Finance Committee be authorized to accept one or other of the following proposals—viz., (1) The Board to pay to the Bank 5s. per cent. for the stock issued to the public and 1s. 3d. per cent. on the amount of stock issued in lieu of the existing holdings of Water Companies' stock; or (2) an inclusive charge of 2s. 6d. per cent., provided that the whole amount of stock required by the Board is issued by the Bank (*i.e.*, stock issued to the public and stock issued to the Companies or their shareholders other than debenture stocks taken over by the Board); and that the Bank of England be paid at the rate of £350 per million per annum on the nominal amount of stock for the management thereof." These recommendations were approved.

The Special Arbitration Committee reported that the Court of Arbitration had directed the Board to pay the taxed costs of the Companies incurred in the arbitration proceedings. The bills of some of the Companies having been delivered, and in view of the importance of the matter, they appointed a Sub-Committee to give special consideration to matters arising in connection with their taxation, and the Solicitors were instructed to place before the Taxing Masters the views of the Sub-Committee on various points which appeared to demand attention in the interests of the Board. The taxation had now been concluded in the case of all the Companies, with the exception of the New River Company, whose costs would stand over until after the appeal to the House of Lords had been disposed of; and it appeared that from the total of the bills as delivered, amounting to £100,371, a sum of £34,318 had been taxed off. The total allowed, including the costs of the taxation, amounted to £67,705. It appeared to be necessary, in order to comply with the provisions of the Metropolis Water Act, 1902, that an estimate should be submitted by the Finance Committee; and they had accordingly forwarded to that Committee an estimate of £69,000 to cover the amount of the taxed costs of the seven Companies and of the interest thereon. As the Board had no option but to pay the taxed costs, and as interest was running at the rate of 4 per cent. on the amount thereof, the Committee presumed the Board would not desire that the approval of the estimate should be adjourned for a fortnight under the provisions of the Standing Order made by the Board on July 24, 1903, under which recommendations involving an expenditure on capital account of sums exceeding £5000 must be adjourned for a week. They therefore recommended that the Standing Order should be suspended in order that the following recommendation might be dealt with: "That the estimate of £69,000 to be submitted by the Finance Committee in respect of the taxed costs, and of interest thereon, of the East London, Grand Junction, West Middlesex, Southwark and Vauxhall, Lambeth, Chelsea, and Kent Companies be approved as an estimate of costs, debt, or liability under section 20 (3) of the Metropolis Water Act, 1902." The recommendation was agreed to.

The Committee further reported that on the 4th of March they informed the Board that the Chelsea Company proposed to appeal against a decision of the Court of Arbitration which declared that the Company were entitled to divide a maximum dividend of 10 per cent. on the ordinary stock only, and 5 and 4½ per cent. respectively on different classes of preference stock. They had now to report that the Court of Appeal, after hearing Counsel for the Company, and without calling on Counsel for the Board, dismissed the appeal, with costs. The Company asked for, and obtained, liberty to appeal to the House of Lords. After some discussion, it was decided to continue the opposition.

The Patent Oil-Fuel Burner Company, Limited, has been registered with a capital of £10,000, in £1 shares, to adopt an agreement with T. Lane, H. Kleins, R. Morrison, and L. Lambert, and to carry on the business of manufacturers of, agents for, and dealers in, oil-fuel burners manufactured under patent No. 26,681 of 1902.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. Telegraphic Address: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN.	1,250,000	ST. CATHERINES (Remodelled) .	250,000	TONBRIDGE	300,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT. . . .	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2nd Cont.) .	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract) . .	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN. . . .	500,000	ROCHESTER (Second Contract) .	500,000
WINDSOR ST., BIRMINGHAM (Second Contract) . . .	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil) . .	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled) . .	125,000	CRYSTAL PALACE DISTRICT .	2,000,000	DULUTH, MINN. (2nd Cont.) .	300,000
MONTREAL	500,000	DULUTH, MINN.	300,000	BROCKVILLE (ONT.) . . .	250,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	SMETHWICK	500,000
BELLEVILLE	250,000	LEICESTER	2,000,000	GRAVESEND	300,000
OTTAWA (Second Contract). .	250,000	ENSCHEDE (HOLLAND) . .	150,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled) . .	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	TORONTO (Third Contract) . .	750,000
		BURNLEY	1,500,000	TORONTO (Fourth Contract) .	1,000,000
		KINGSTON-ON-THAMES . .	1,750,000	MONTREAL, ONT. (2nd Cont.) .	1,800,000
		ACCRINGTON.	500,000	HAMILTON, ONT.	400,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
AND, IN ADDITION, 3,000,000 CUBIC FEET DAILY.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

A short meeting of the Edinburgh and Leith Gas Commissioners was held on Monday, at which a discussion took place upon the price of gas. It was recommended by the Works Committee that the price for public lighting should be 2s. 5d. per 1000 cubic feet, with ordinary burners, but that for incandescent gas lighting the figure should be 2s. Mr. Carmichael moved that 2s. be the price charged for all gas used for lighting, provided that burners consuming at least 3 cubic feet per hour were employed. He did not see why the Commissioners should supply gas at 2s. per 1000 cubic feet for incandescent lighting, and not apply the same figure to ordinary lighting. He thought that the Corporations had not done quite justice to the Gas Commissioners in the matter of public lighting, in that they had only been allowed 2 cubic feet of gas per hour. Previous to the transfer, they never burned less than 2½ cubic feet per hour. Gradually, however, this had been changed; and they were now burning not more than 2 cubic feet per hour in each lamp. He thought this was an injustice to the Commissioners, because it gave the public the idea that the gas was bad. If they were to reduce the price all round to 2s. per 1000 cubic feet, it would encourage the Corporations to give better lighting than they do at present. Mr. A. A. Murray, who seconded, said he thought it was bad policy to begin a differential rate between the two classes, and that if they could afford to supply gas for 2s. for incandescent lamps, they could afford to sell it at the same price all over. The Chairman—Provost Mackie, of Leith—said it was clearly stated at the Committee meeting that they could not afford to supply gas all round at 2s. per 1000 cubic feet. The recommendation of the Committee was adopted by 13 votes to 3. The petition by traders with reference to the opening of shops in which incandescent gas appliances will be sold was sent to the Works Committee for report.

The proposal to convert all the public gas-lamps in Edinburgh to the incandescent system has ended in a compromise. Only one-fifth are to be so altered during the next year; leaving it free to the Town Council in future years to continue the process of conversion, or to cease the movement for improving the light, or, again, to extend the electric lighting. The failure to carry the first proposal, which was that all the flat-flame lamps should be converted, is, I consider, to be attributed to the action of the Cleaning and Lighting Committee—I might almost say to their bungling. Their report was brought forward in an incomplete state, because, while recommending the adoption of the incandescent gas system of lighting, they stated that they were still experimenting as to the size of burner to be employed. I suppose, if search were made for a reason for the haste of the Cleaning and Lighting Committee, it would be found in the fear which was entertained in some quarters that the Gas Commissioners might get hold of the public lighting. It is a great pity the Commissioners did not, for then the public lighting would have been in the hands of a body who understand something about the lighting effect to be obtained from the different types of illuminating apparatus, which the Cleaning and Lighting Committee have, both by their long inaction and by their continued experimenting, shown they do not. The matter is settled now, however, for a year; and if what is to be done be intelligently gone about, the experience gained should be of service in promoting the movement if and when it is again taken up.

The Corporation of Perth are endeavouring to formulate a scheme to regulate the payment of wages to their workmen during sickness. The greater number of the Corporation employees are in the Gas Department. It is recommended that the Medical Officer of Health should be the certifying doctor to the Department. Under the scheme, men who have been over one year and under five years in the service are to receive half wages for one month; men who have been over five and under ten years are to receive half wages for two months; men who have been over ten and under twenty years are to receive half wages for three months, and quarter wages for the other three months; and men who have been over twenty years in the service are to receive full wages for one month, half wages for three months, and quarter wages for the other six months. All the employees in the Gas Department are recommended to join a friendly society. Last year, it is stated, the sum of £150 was paid as wages to men in the gas-works when sick; and the Corporation are anxious to save upon this head of outlay.

A correspondent writes in the "Glasgow Herald" of Thursday: "We understand that, apart from Glasgow Corporation, about 50 per cent. of the gas corporations in Scotland have fixed, or will fix in a day or two, their contracts for coal for the ensuing season. With the exception of first-class cannel, which commands previous quotations, prices are stated to show an all-round decline in contrast with last year's figures; second and third-class cannels being from 6d. to 9d. per ton cheaper, splint 3d. to 6d., and first and second-class shales roughly about 1s. per ton."

The Gas and Electric Lighting Committee of the Aberdeen Town Council on Wednesday had before them tenders for the coal required in the Corporation gas-works during next year; and they agreed to recommend the purchase of 66,000 tons, at the average price of 15s. 9d. per ton delivered. The average price under the current contract is 16s. 3d. per ton.

At a meeting of the Gas-Works Committee of the Inverness Town Council on Tuesday, Mr. M'Bean said that, as the result of inquiries in regard to the bringing of coal to the gas-works by sea instead of by rail, he found that there would be a saving of over £1000 a year by doing so. The freight by rail from Lanarkshire and Fifeshire is 7s. 8d. and 6s. 8d. per ton respectively; while the total cost by sea, after paying shipping charges, harbour, and other dues, would be about 4s. 9d. per ton. The Committee unanimously agreed to recommend that tenders be asked for the sea carriage of coal. This is surely a subject which could not have been overlooked; and the conclusion I come to is that the railway influence must have been stronger than the shipping interest in the Town Council. The Council have quarrelled with the Railway Company over the collection of petty customs. Is this the first outcome of it?

THE

PARKINSON

"CROWN"

COOKER

SHOWING HOT-PLATE

HINGED TO FACILITATE

CLEANING OF BURNERS, &c.

PARKINSON AND W. & B. COWAN, LTD.

(*Parkinson Branch*),

COTTAGE LANE, CITY ROAD, LONDON. | BELL BARN ROAD, BIRMINGHAM.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 30.

Sulphate of Ammonia.

The tendency of the market is still in favour of buyers, and makers have had to give further concessions in order to dispose of current production. The closing quotations are £12 3s. 9d. per ton f.o.b. Hull and £12 5s. to £12 6s. 3d. per ton f.o.b. Liverpool and Leith. Home requirements continue, but only on a limited scale, and the market has had to depend mainly upon Colonial demand. For near months there has been speculative offering abroad at a discount of 2s. 6d. to 5s. per ton upon prompt prices; and with these quotations before them, Continental and Spanish buyers cannot be induced to entertain prompt business.

Nitrate of Soda.

This is in good demand both on the Continent and in the United Kingdom, and the local prices are 10s. 3d. to 10s. 6d. per cwt., according to quality.

LONDON, *April* 29.

Tar Products.

These remain in about the same position, though there has perhaps been rather more inquiry; but prices as a rule have a downward tendency. There is still a fairly good inquiry for pitch from South Wales; but consumers only offer prices considerably under those at present asked by makers and dealers, although there is a report that business was arranged over the last six months of next year with one of the large companies on fairly reasonable terms. On the Continent, dealers are reported to be quoting very low prices indeed; but there does not appear to be much demand. Consumers still hold off the market in the hope of lower prices. The London market is decidedly quiet, and there does not appear to be any business doing; dealers not being at present inclined to pay the prices asked by makers. In benzol, some quantity of 50-90 per cent. is reported to have been sold for home consumption; while in 90 per cent. there have been inquiries for export. But Continental buyers are not willing to pay the prices asked by makers here. It is, however, reported that English dealers have just secured some 3000 to 4000 gallons at 9d. f.o.b. There is nothing fresh to advise in toluol, and prices are purely nominal. The depression in solvent still continues; and it is really difficult to fix the actual value. Very low prices have been accepted by makers at Goole and Hull for export; while so far as London is concerned, there does not appear to be anything doing. In creosote, there is more inquiry in the North for consumption in Yorkshire. Consumers will not, however, pay the prices asked by makers; and it is more than probable that the latter will have to reduce their ideas if they wish to arrange business to any extent. In London, there is no business to report. The position of anthracene remains unchanged. Business is reported for delivery over the last six months of the present year in 40-45 per cent. for fairly good quality at reasonable prices; and the German consumers are reported to be inquiring for delivery all over next year. Carbolic acid continues very firm. A considerable business has been done at 2s. for May-June shipment; and makers are now inclined to slightly advance their prices. In crystals, the inquiry appears to have fallen off for the time being; and as regards forward delivery, the German producers seem to be willing to accept lower prices than those at present ruling.

The average values during the week were: Tar, 17s. 6d. to 22s. 6d. Pitch, London, 33s.; east coast, 32s. to 32s. 6d.; west coast, 31s. to 31s. 6d. Benzol, 90 per cent., 9d. to 9⅛d.; 50-90 per cent., 7d. Toluol, 6⅜d. Crude naphtha, 3d. to 3¼d.; solvent naphtha, 6⅜d. to 8d.; heavy naphtha, 10d. to 10⅛d. Creosote, London, 1⅛d. to 1⅝d.; North, 1¼d. Heavy oils, 2¼d. to 2⅜d. Carbolic acid, 60 per cent., 2s. Refined naphthalene, £5 to £8; salts, 22s. to 24s. Anthracene, "A" quality, 1¾d. to 2d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market is decidedly quiet, and closes with a much easier tone all round. Beckton have accepted £12 2s. 6d. for early delivery; but it is reported that dealers are offering on Beckton terms at £12, and even under. Early in the week, South Metropolitan sold a certain quantity at £12 5s. on their own special terms; but they could not now realize this figure. A small business is reported in Hull at £12 5s. for early delivery; but there is not much inquiry forward. The market at Liverpool appears very depressed, and sales are reported at £12 2s. 6d. for shipment early in May. In Leith, there is really no business to report. The market closes with a very quiet tone, and the actual value may be taken at £12 5s.; but even at this price there are no buyers for early delivery.

Messrs. Robert Dempster and Sons, Limited, of Elland, have received the order from the Broughty Ferry Council to put in hand new regenerator settings, cannel-breaker, alterations to bucket conveyor, coal-hoppers, stage floor, &c. The work has to be carried out to plans and under the supervision of Mr. George Keillor, the Council's Gas Engineer.

The net profit of the Liverpool Gas-Fittings Company, Limited, for the past year amounted to £1510, which, with the balance of £82 brought forward, left £1592 to the credit of profit and loss. The Directors recommend a dividend for the year at the rate of 10 per cent., with a bonus of 1s. per share (free of income-tax), which will leave a balance of £92 to be carried forward.

It is stated that the Wright and Butler Manufacturing Company, Limited, of Birmingham, have found it necessary to go into voluntary liquidation, for the purpose of reconstruction; and that for this purpose Mr. Cephas Butler (one of the founders) and Mr. A. H. Gibson are to act as Joint Liquidators. There is no question of bankruptcy; but it is felt the finances of the Company require some considerable amount of re-arrangement.

THE

MAXIM PATENT

CARBURETTOR

For Enriching Gas in Bulk.

Prevents Naphthalene Deposits.

OVER . . . . .

120

MAXIM PATENT CARBURETTORS

HAVE NOW BEEN FIXED.

Among the Companies and Towns supplied are The Gaslight and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Oldham, Dundee, Perth, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past **Ten Years.**

More Gas and Saleable Coke per Ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

THE ENRICHMENT IS INSTANTANEOUS AND PERMANENT.

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel

DEALERS IN

Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.

For Prices and full Particulars, apply to the

Gas Lighting Improvement Co.

LIMITED,

18, Devonshire Street,

BISHOPSGATE, LONDON, E.C.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Although with the opening of the month there has been no further general official giving way in prices following the reduction by the Manchester colliery concerns with the commencement of April, the whole position is one of weakness, with supplies of all classes of fuel in excess of requirements and pits again getting on to short time. Already at most of the collieries there are tolerably heavy stocks, and there is no intention of increasing these during the summer; so that, with the present prospects of trade, about half time would seem to be very probable as about an average that the pits are likely to work during the ensuing four or five months. House-fire coals are only in very indifferent request; and although, as already stated, there is no actually general official reduction, prices are gradually easing down. The average at the pit is about 13s. to 14s. per ton for the best qualities of Wigan Arley, 11s. to 12s. for seconds Arley and Pemberton four-feet, and from 9s. to 10s. for common house-fire coals. The position with regard to the lower qualities of round coals remains still more unsatisfactory. Inland requirements for iron-making, steam, and general manufacturing purposes continue much below the average; and there is a good deal of cutting in prices for quantities or contracts—7s. 9d. to 8s. per ton becoming very common quotations for ordinary steam and forge coals, with anything materially above these figures only obtained for special qualities. So far as gas-coal contracts are concerned, nothing of any great moment has yet been settled; but reductions of 3d. to 6d. per ton on last year's prices seem likely to represent the average basis for the ensuing season. This means that common gas coals are to be bought from 7s. 9d. to 8s. per ton, with better qualities higher in proportion; but it is as yet too early to fix any really definite figures generally. The locomotive fuel contracts have been put through at a minimum reduction of 3d. per ton upon last year. Railway companies decline to pay more than 7s. 6d. at the pit; and it is not improbable there may be some cutting on even this low figure, as there is certain to be considerable competition with Derbyshire for further quantities that have to be supplied. Engine fuel during the last few weeks has become more plentiful, and the commoner sorts of slack are generally a drug on the market, with very low-cut prices to effect clearances. As, however, there is a probability of a very general resort to short time at the pits, the quantity coming on the market will of necessity be correspondingly curtailed. For the better qualities of slack, prices are fairly steady at about 6s. to 6s. 6d. per ton, with medium sorts 5s. to 5s. 6d., and common slacks to be bought in Lancashire from 3s. 9d. to 4s. 3d. and 4s. 6d., and in Derbyshire at from 2s. upwards at the pit. The shipping demand for steam coals remains slow, with 9s. to 9s. 3d. per ton about average figures for delivery at the Mersey ports or the Manchester Ship Canal.

Northern Coal Trade.

The coal trade is a little brisker, now that the shipments have started in earnest to the Baltic—one of the great markets of the northern coalfield. There is, however, no great pressure in the demand; and prices for some qualities of fuel show a little ease. Steam coals are being more freely exported. Best Northumbrians are about 10s. 6d. per ton f.o.b., second-class steams are about 9s., and steam smalls from 4s. 9d. to 5s. 4½d.—the steam coal collieries being now generally well employed. In the gas coal trade, prices are steady. A Norwegian contract, for some 30,000 tons for the year, is just about settled at a price some 6d. below that of the past year—the usual reduction now. Gas coals, for occasional cargoes, vary from 7s. 10½d. to 8s. 3d. per ton f.o.b., according to the quality and period over which the delivery extends. Good gas coke is quoted from 13s. to 13s. 6d. per ton f.o.b.

Scotch Coal Trade.

Trade is unchanged. Outputs are moving off freely, and prices are unaltered. The slight stiffening of prices at the present moment is having an effect which is not favourable to smaller gas managers who are engaged in negotiating annual contracts for gas purposes; but at most, so far as can be seen, the effect will not go beyond keeping prices at about what they have been. The movement is not so pronounced yet as to induce a rise. In the case of large contracts, indeed, a fall is expected. The prices quoted are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. 3d. to 9s. 6d., and splint 8s. 9d. to 9s. The shipments for the week amounted to 228,680 tons—a decrease of 4107 tons upon the preceding week, but an increase of 26,521 tons upon the corresponding week of last year. For the year to date, the total shipments have been 3,104,332 tons—an increase of 47,065 tons upon the same period of 1903.

Messrs. Graham, Morton, and Co., Limited, are carrying out, at the Binchester Colliery, near Spennymoor, for Messrs. Bolckow, Vaughan, and Co., Limited, of Middlesbrough, a large contract, secured by open tender, for the supply and erection of a rubber belt conveyor and the structural work in connection therewith. The plant consists of a coal conveyor, supported on lattice girders resting on built-up trestles; also the corrugated iron sheeting for covering the sides and top. The belt is of Graham's patent section, composed of rubber and canvas, the rubber at the centre being thicker to resist the increased wear at this point. The length of the belt is 693 feet, and its carrying capacity 50 tons per hour. The structural work on which the conveyor is supported consists of two wrought-iron lattice girders, each 324 feet long, and 5 ft. 6 in. deep, built up of iron runners, angle-iron stanchions, and flat-iron cross-bracings. The top girders are tied together to form one complete box girder by means of T-iron ties. In the box girder is placed and supported the conveyor and gantry, the latter being of 2-inch wood planking. The top and sides are covered by means of 20 B.W.G. corrugated sheeting. On each side are arranged sliding-doors for the purposes of ventilation and light. The girders are supported at intervals of 40 feet by wrought-iron trestles, bolted to concrete foundations. These trestles are 19 feet high, and are constituted of angle-irons riveted back to back as uprights, and tied at the top by channel-irons, and cross-braced by means of flat bar iron. The conveyor is driven by a motor of 15 brake horse power.

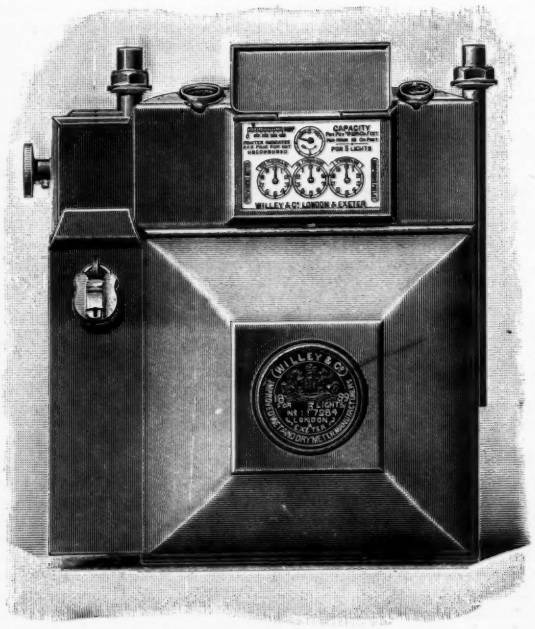
THREE POINTS

of advantage from the many found in our Slot Meters are:

1st.—They are Fraud Proof, and Cannot be tampered with through the Slot.

2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



ALL PARTS INTERCHANGEABLE.

Tens of Thousands in use, and adopted exclusively by many Gas Companies.

WILLEY & CO., LTD., LONDON & EXETER.

The Richmond Gas Stove and Meter Company, Limited, have received instructions from the Gaslight and Coke Company to undertake a portion of the fitting up of their automatic meter supplies—the arrangement to continue until the end of 1907. Messrs. Richmond anticipate that this will represent the fitting up of not less than 12,000 houses.

We are asked to state, with regard to the notice which appeared in our issue of the 19th ult., that the management of the business of Messrs. Bryan Donkin and Clench, Limited, will continue as hitherto under the direct supervision of Messrs. E. Bryan Donkin and Harry J. Donkin. The appointment of Receiver referred to in the above-mentioned paragraph was made in the interests of the debenture holders pending a financial re-arrangement of the Company's affairs.

Visitors to the Arts and Crafts Section of the Exeter Trades Exhibition took great interest in a useful invention entered by Mr. W. D. Sheppard, of that city, for which he was awarded a silver medal (the highest award). It is a high and low pressure boiler for gas-stoves, by which the heat from the gas-jets is utilized for warming water without impeding the heat for cooking purposes. This is accomplished by a small triangular boiler fixed at the lower part of the stove, just over the burners, in such a way as to deflect the heat. The sample shown had a small fountain fixed by the side of the stove, this being for small households; but it can be applied with equal effect for purposes where large quantities of water are required—the cylinder being connected with the stove on the same flow-and-return system as with ordinary kitchen ranges.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.
ASSISTANT GAS AND WATER MANAGER. Barrow-in-Furness Corporation. Applications by May 17.
DRAUGHTSMAN. Derby Gaslight Company.
WORKING MANAGER. Woodbridge Gaslight Company. Applications by May 5.
WORKING MANAGER. Cefn and Rhosymedre Gas-Works, Ruabon.
MANAGER. Athy Gas-Works.

Situations Wanted.
ASSISTANT-MANAGER. No. 4178.
MANAGER OR WORKING MANAGER. No. 4203.

Plant for Sale.
CONDENSER (250,000 feet). Redditch Gas-Works.
PURIFIERS, &c. Blyth and Cowpen Gas Company.
RETORTS. Stretford Gas-Works.
TWO COMPLETE GAS-WORKS PLANTS, &c. Wath-on-Dearne Gas Company.

Plant, &c., Wanted.
PURIFIERS. Brackley Gas-Works.
TEST METER. Rogers, 26, Victoria Street, London.

Mortgage Wanted. Blyth, Dutton, Hartley, and Blyth, London.

Shares Wanted. Martin, Streatham.

Stocks and Shares for Sale.
CANTERBURY GAS AND WATER COMPANY. May 18.
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. May 17.
DEAL AND WALMER COMPANY. May 24.
GREAT YARMOUTH GAS COMPANY. May 17.
HORNSEY GAS COMPANY. May 17.
LAMBETH WATER COMPANY. May 9.
LEA BRIDGE GAS COMPANY. May 17.
SOUTH ESSEX WATER COMPANY. May 17.
SOUTHEND WATER COMPANY. May 17.
SWANAGE GAS AND WATER COMPANY. May 17.

TENDERS FOR

Benzol.
DARWEN GAS DEPARTMENT. Tenders by May 27.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by May 10.

Brass Fittings, &c.
DARWEN GAS DEPARTMENT. Tenders by May 27.

Coal and Cannel.
BARROW-IN-FURNESS CORPORATION. Tenders by May 18.
BATLEY CORPORATION. Tenders by May 18.
BIRKENHEAD CORPORATION. Tenders by May 19.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 18.
CROMER GAS COMPANY. Tenders by May 9.
DARWEN GAS DEPARTMENT. Tenders by May 27.
DEVONPORT GAS DEPARTMENT. Tenders by May 25.
HAVERHILL GAS DEPARTMENT. Tenders by May 17.
LEIGH-ON-SEA URBAN DISTRICT COUNCIL. Tenders by May 16.
LIVERPOOL GAS COMPANY. Tenders by May 16.
PRIMITIVA GAS AND ELECTRIC LIGHTING COMPANY.
RICHMOND (SURREY) TOWN COUNCIL. Tenders by May 30.
ROMFORD GAS AND COKE COMPANY. Tenders by May 12.
SOUTH STAFFORDSHIRE WATER COMPANY. Tenders by May 16.
THAMES VALLEY AND GORING WATER AND GAS COMPANY. Tenders by May 13.
WATFORD GAS COMPANY. Tenders by May 9.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by May 10.

Conveying Machinery and Storage Hoppers for Coke.
SALFORD GAS DEPARTMENT. Tenders by May 18.

Cookers.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by May 10.

Lime.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 18.

Meters.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by May 10.

Oil for Gas Making.
BARROW-IN-FURNESS CORPORATION. Tenders by May 18.

Paint and Oil.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by May 10.

Pipes and Specials (Wrought and Cast), &c.
DARWEN GAS DEPARTMENT. Tenders by May 27.
WILMSLOW AND ALDERLEY EDGE GAS COMPANY. Tenders by May 10.

Retort Bench, Chimney, and Alterations.
BRIDGENORTH GAS DEPARTMENT. Tenders by May 14.

Sulphuric Acid.
BRENTWOOD GAS COMPANY. Tenders by May 10.

Tar and Ammoniacal Liquor.
DARWEN GAS DEPARTMENT. Tenders by May 27.
BURTON-ON-TRENT GAS DEPARTMENT. Tenders by May 18.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 294.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	19½—20½	+½	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Nov. 12	6½	Bombay, Ltd.	6—6½	..	5 4 0
140,000	5	,,	6½	Do. New, £4 paid	4¾—5¼	+¼	4 18 11
380,000	Stk.	Feb. 25	12	Brentford Consolidated	237—242	..	4 19 2
300,000	,,	,,	9	Do. New	178—183	..	4 18 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	127—132	..	3 15 9
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	103—108	..	3 14 1
220,000	Stk.	Mar. 10	10⅝	Brighton & Hove Orig.	205—210	..	5 2 4
246,320	,,	,,	7⅝	Do. A. Ord. Stk.	145—150	..	5 3 4
460,000	20	Apl. 14	10	British.	38—39	..	5 2 7
100,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	112—117	..	5 2 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	85—90	..	5 0 0
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd	11¼—11⅝	+¼	5 19 2
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	91—93	..	4 6 0
150,000	20	Mar. 10	8¼	Cagliari, Ltd.	21—23	..	7 3 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14—15	..	6 13 4
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Feb. 25	5 5/16	Commercial 4 p.c. Stk.	104—109	..	4 15 5
536,485	,,	,,	5	Do. 3½ p.c. do.	102—105	..	4 15 3
442,947	,,	Dec. 11	3	Do. 3 p.c. Deb. do.	85—87	..	3 9 0
800,000	Stk.	Dec. 30	7	Continental Union, Ltd.	113—118	+1	5 18 8
200,000	,,	,,	7	Do. 7 p.c. Pref.	138—143	+1	4 17 7
575,000	Stk.	Feb. 25	5½	Crystal Palace Ord. 5 p.c.	115—120	..	4 8 10
60,000	,,	,,	5	Do. 5 p.c. Pref.	115—120	..	4 3 4
112,533	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	134—137	..	3 13 10
486,090	10	Jan. 28	10½	European, Ltd.	18½—19½	..	5 7 8
354,060	10	,,	10½	Do. £7 10s. paid	13½—14½	..	5 8 8
15,243,200	Stk.	Feb. 11	4 1/16	Gas-light and Coke	4 p.c. Ord.	95—97	+2	4 10 9
2,600,000	,,	,,	3⅛		3⅛ p.c. max.	88—90	..	3 17 9
3,799,735	,,	,,	4		4 p.c. Con. Pref.	105—108	+1	3 14 1
4,193,975	,,	Dec. 11	3		3 p.c. Con. Deb.	87—89	..	3 7 5
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.		90—95	..	5 5 3
70,000	10	Apl. 28	11	Hongkong & China, Ltd.		15—16*	..	6 17 6
3,800,000	Stk.	Nov. 12	10	Imperial Continental		203—208	..	4 16 2
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.		98—100	..	3 10 0
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.		112—117	..	5 2 7
561,000	Stk.	Feb. 25	10	Liverpool United A		210—211	..	4 14 9
718,100	,,	,,	7	Do. do. B		158½—160½	..	4 7 3
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.		108—110	..	3 12 9
75,000	5	Dec. 11	5	Malta & Medn., Ltd.		4¼—4⅜	..	5 5 3
560,000	100	Apl. 5	5	Met. of	5 p.c. Deb.	100—103	..	4 17 1
250,000	100	,,	4½	Melbourne	4½ p.c. Deb.	101—102	..	4 8 3
541,920	20	Nov. 12	3½	Monte Video, Ltd.		9½—10½	..	6 13 4
1,515,892	Stk.	Feb. 26	4½	Newc'tle & G'tesh'd Con.		103—104	—½	4 6 7
405,025	Stk.	Dec. 31	3⅜	Do. 3½ p.c. Deb.		93½—94½	..	3 14 1
300,000	Stk.	Nov. 26	8	Oriental, Ltd.		135—140	..	5 14 4
600,000	5	Mar. 29		Ottoman, Ltd.		5⅜—6	..	5 16 8
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	Jan. 14	6½	Ply'mth & St'house 5 p.c	121—126	..	4 17 2
851,070	10	Apl. 28	7	River Plate Ord.	11½—12*	..	5 16 8
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
250,000	10	Mar. 29	7	San Paulo, Ltd.	11—12	..	5 16 8
135,000	Stk.	Mar. 10	10	Sheffield A	236—238	..	4 4 0
209,984	,,	,,	10	Do. B	235—237	..	4 4 5
523,498	,,	,,	10	Do. C	234—236	..	4 4 9
116,106	Stk.	Mar. 29	5	Shrewsbury Ord. 5 p.c.	107—110	..	4 10 11
6,150,000	Stk.	Feb. 11	5½	South Met., 4 p.c. Ord.	124—127	+1	4 3 11
1,832 700	,,	Jan. 14	3	Do. 3 p.c. Deb.	86—89	..	3 7 5
380,940	Stk.	Nov. 12	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	Jan. 14	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton	A. 5 p.c.	118—123	+3	4 17 7
313,020	,,	,,	4½		B. 3½ p.c.	95—100	..	4 10 0
182,380	10	Dec. 30	8	Tuscan, Ltd.		£½—9	..	8 17 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.		97—99	..	5 1 0
745,872	Stk.	Mar. 10	5	West Ham, 5 p.c. Ord.		95—100	..	5 0 0
				WATER COMPANIES.			
781,517	Stk.	Dec. 30	12	Chelsea, Ord.		352—357	..	3 7 3
150,000	,,	,,	5	Do. 5 p.c. Pref.		142—147	..	3 8 0
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75		132—137	..	3 5 8
175,785	,,	Mar. 29	4½	Do. 4½ p.c. Deb.		130—135	..	3 6 8
1,720,560	Stk.	Mar. 29	8	East London, Ord.		218—223	..	3 11 9
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.		130—135	..	3 6 8
1,524,288	,,	,,	3	Do. 3 p.c. Deb.		87—90	..	3 6 8
700,000	50	,,	10	Grand Junction	10 p.c. max.	136—139	..	3 11 11
310,000	Stk.	Mar. 29	4		4 p.c. Deb.	115—120	..	3 6 8
708,000	Stk.	Feb. 25	10	Kent		315—320	..	3 2 6
160,000	,,	,,	7	Do. New, 7 p.c. max.		217—222	..	3 3 0
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.		314—319	+2	3 9 0
406,200	100	,,	8½	Do. 7½ p.c. max.		223—233	..	3 13 0
350,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb.		115—120	..	3 6 8
500,000	100	Feb. 25	10	New River, New Shares		360—370	..	2 14 0
1,000,000	Stk.	Jan. 28	4	Do. 4 p.c. Deb.		117—120	..	3 6 8
902,300	Stk.	Dec. 30	7½	South-wark and Vauxhall	Ord.	275—280	..	2 13 7
126,500	100	,,	7½		7½ p.c. max.	215—225	..	3 6 8
489,200	Stk.	,,	5		5 p.c. Pref.	144—149	..	3 7 1
1,019,585	,,	Mar. 29	4		4 p.c. A Deb.	115—120	..	3 6 8
1,155,066	Stk.	Dec. 11	10	West Middlesex.		295—300	..	3 6 8
200,000	,,	,,	4½	Do. 4½ p.c. Deb.		130—135	..	3 6 8
200,000	,,	Mar. 10	3	Do. 3 p.c. Deb.		88—90	..	3 6 8
				* Ex div.			

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,

VICTORIA PAINT WORKS, MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS

PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

ATTERTON'S Patent Charging Machine, especially adapted for Small Works up to 50 Millions. Nearly 40 already supplied, and still supplying. Would soon repay for small outlay. Increased make and reduction in cost.

Apply to E. PADFIELD AND CO., 96 & 98, Leadenhall Street, LONDON, E.C.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.

Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

APPOINTMENT wanted as Assistant-MANAGER in Gas-Works. Trained at Engineering Works. Recently prepared Drawings and Superintended erection of large up-to-date Gas-Works. Good knowledge of Chemistry and Gas-Works Routine. Honours Gas Manufacture.

Address No. 4178, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Re-engagement as Gas MANAGER or WORKING MANAGER. Twenty-Six Years in present Situation. Thorough knowledge of Erections, Extensions, Mains, and Services. Good Carbonizer. Member of E.C.G.M.A.

Address No. 4203, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS Manager Wanted. Salary £80 per Annum, payable monthly, with comfortable House, Large Garden, Fuel, and Light.

For Particulars, apply to MICHAEL ANTHONY, Secretary, ATHY GAS-WORKS.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.

Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

COAL GAS TAR wanted.

ROBINSON BROTHERS, LIMITED. Works: WEST BROMWICH, KNOTTINGLEY, and SPONDON.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.

MELROSE CYCLE COMPANY, COVENTRY.

WORKING Manager required for small Gas-Works (7 Million cubic feet). Must be a good Fitter and reliable man. Wages 34s. per week, with House, Coal, and Gas.

Apply SECRETARY, Cefn and Rhosymedre Gas Company, Limited, RUABON.

THE Derby Gaslight and Coke Company require a DRAUGHTSMAN who has had experience in Constructional Ironwork, &c.

Applications, stating Age, Experience, and Qualifications, with Salary required, accompanied by *copies* only of not more than Three recent Testimonials, to be sent to the ENGINEER, Gas Offices, Friar Gate, DERBY.

THE Woodbridge Gaslight and Coke Company, Limited, will shortly require a competent WORKING MANAGER, not under 25 nor more than 40 Years of Age.

He must be able to take the entire charge of the Works, and the control of Men, and have had practical Experience in Main and Service laying, Meter Taking, and all Branches of Manufacture, Purification, and Distribution of Gas.

Amount of Coal carbonized, about 1400 Tons annually.

Wages to commence, 32s. 6d. per week, with Coal, Gas, and Water free, and an allowance for Rent.

Applications, in own handwriting, accompanied by Three recent Testimonials, and giving full Particulars of Experience, to be sent in, on or before May 5 next, to ALFRED GALL, Secretary to the Company, WOODBRIDGE.

BOROUGH OF BARROW-IN-FURNESS.

THE Corporation invite Applications for the appointment of ASSISTANT-MANAGER of the Gas and Water Works. Salary £130 per Annum.

Applicants must be competent Draughtsmen, and have a thorough knowledge of Gas Making and Main and Service Laying.

Applications, in own handwriting, stating Age, Experience, present and previous occupation, and accompanied by *copies* of not more than Three Recent Testimonials, to be addressed to the Chairman of the Gas and Water Committee, endorsed "Assistant-Manager," and delivered at the Town Clerk's Office, not later than Tuesday, the 17th of May, 1904.

Canvassing Members of the Council will be a disqualification.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

WANTED, a Second-Hand Test Meter. Must be in perfect order.

Apply, by letter, giving all Particulars and lowest Price, to L. ROGERS, 26, VICTORIA STREET, S.W.

WANTED to purchase Gas Shares, STOCK, or DEBENTURES of any good dividend-paying Company; also Water-Works Shares and Debentures. Size and location of Company immaterial. Securities that have failed to realize reserves at auction considered.

Address Mr. MARTIN, 41, Shubbery Road, Streatham, LONDON.

GAS-PURIFIERS.

WANTED, 3 or 4 Second-Hand PuriFIERS, with loose trays for Gas Lime, about 10 feet by 8 feet. Must be in good condition.

State exact measurement offered, and lowest price delivered, also say where can be seen, to JOHN G. CLARKE, Gas-Works, BRACKLEY.

OXIDE OF IRON.

(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL.

5, CROOKED LANE, LONDON, E.C.

COAL GAS TAR wanted.

BEST PRICES GIVEN.

SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."

Telephone: 341 AVENUE.

RETORTS FOR SALE.

TEN 10-feet lengths of 19-in. by 15-in. ⌂ RETORTS FOR SALE. Best Stourbridge make.

Offers to GAS ENGINEER, STRETFORD.

CONDENSER for Sale. In splendid Condition. Cheap. Capacity 250,000 Cubic Feet per Twenty-four hours.

Apply to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

£2500 to £3000 required. First Mortgage. Four-and-a-Half per cent. Interest, payable Half Yearly. Security: Good paying Gas-Works, Provisional Order.

Apply to Messrs. BLYTH, DUTTON, HARTLEY, AND BLYTH, Solicitors, 112, Gresham House, Old Broad Street, LONDON, E.C.

HORNSBY Akroyd Oil-Engine, portable type, 12½ N.H.P., complete on strong wrought-iron frame and wheels, practically new.

BLACKSTONE OIL-ENGINE, 3½ H.P. Horizontal.

Three GARDNER GAS-ENGINES, 10 and 4½ H.P., with Tank and Fittings Complete, and all equal to new.

Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

PURIFIERS.

THE Blyth and Cowpen Gas Company have FOR DISPOSAL a set of Four PURIFIERS, each 10 feet square, with 10-inch Connections, Dry Faced Centre and Check Valves, Girders, and Lifting Gear for same. Erected by R. Dempster and Sons, Elland.

Offers to A. C. FAWCETT, Secretary to the Company, Blyth, NORTHUMBERLAND.

WATH-ON-DEARNE AND DISTRICT GAS COMPANY, LIMITED.

SALE BY TENDER.

THE Directors offer for Sale the disused PLANT, capable of making 20 Million cubic feet of Gas per Annum, comprising 27 ⌂ RETORT MOUTHPIECES, with HYDRAULIC MAINS, CONDENSERS, TOWER SCRUBBER, ROOTS EXHAUSTER, and Four PURIFIERS, with Valves and Connections, also 10 ⌂ MOUTHPIECES, with PIPES and HYDRAULIC MAIN and CONDENSERS. And at Bolton-on-Dearne a complete Small WORKS, including HOLDER, 10,000 cubic feet, 10 ⌂ RETORT MOUTHPIECES, with PIPES, HYDRAULIC MAIN and Three PURIFIERS and CONDENSERS and all Connections. Inspection invited.

Further Particulars from G. Wright, Manager.

Tenders to be sent in to

TOM NASH,
Secretary.

Gas-Works, Wath-on-Dearne, Yorks.

TENDERS FOR GAS COAL.

THE Directors of the Watford Gas and Coke Company invite TENDERS for the supply of 11,500 Tons (more or less) of GAS COAL, screened or unscreened, to be delivered at the Bushey Station of the London and North-Western Railway between July 1, 1904, and June 30, 1905.

Forms of Tender and all Information may be obtained on application, in writing only, to me the undersigned.

Tenders must be on the Form supplied, any alteration of which will invalidate the Tender.

Tenders to be delivered on or before the 9th day of May, 1904, addressed to the Chairman of the Watford Gas and Coke Company, Watford, endorsed "Tender for Gas Coal."

The Directors do not bind themselves to accept the lowest or any Tender.

J. DUNCAN ROYAL,
Secretary.

Watford Gas and Coke Company's Offices,
Watford, April 18, 1904.

Shrewsbury Gas Light Company. W. Belton, A.M.I.C.E., Engineer.

HOT COKE CONVEYOR, OVERHEAD HOPPERS, AND STACKING CONVEYOR,
MADE AND ERECTED IN 1903 BY

ROBERT DEMPSTER & SONS LTD., ELLAND, YORKS.

Printed for Walter King, by King, Sell & Olding, Ltd.; and published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, May 3rd, 1904.

Collotype by Waterlow & Sons Ltd.

ROBERT DEMPSTER & SONS, Ltd.,
Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

GAS COAL.

THE Directors of the Thames Valley and Goring Water and Gas Company, Limited, invite TENDERS for supplying Good GAS COAL to Goring-on-Thames Railway Station (Great Western Railway) in such quantities as may be required for Twelve Months.

The Directors reserve the right to accept any Tender.

No Special Form necessary.

Tenders, endorsed "Gas Coal," to be addressed to the Chairman, Thames Valley and Goring Water and Gas Company, Limited, 20, Bucklersbury, London, E.C., and delivered not later than Ten a.m. on May 13, 1904.

J. HUNT,
Secretary.

Goring-on-Thames,
April 30, 1904.

BOROUGH OF DARWEN.

TENDERS FOR GAS SLACK.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply of GAS SLACK, PEAS, and NUTS, for One Year, to be delivered at the Gas-Works Siding in the Corporation Waggons.

Forms of Tender and all Information as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Gas Slack," must be delivered to the undersigned not later than the 27th of May, 1904.

No Tender necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, April 26, 1904.

BOROUGH OF DARWEN.

TENDERS FOR TAR.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for all the surplus TAR produced at their Gas-Works for One Year.

Further Particulars and Forms of Tender may be obtained on application to Mr. A. H Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Tender for Tar," must be delivered to the undersigned not later than the 27th of May, 1904.

The highest or any Tender not necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, April 26, 1904.

BOROUGH OF DARWEN.

THE Gas Committee of the above Cor- poration are prepared to receive TENDERS for the supply of the following GOODS for One Year—

BENZOL.
WROUGHT-IRON TUBES AND FITTINGS.
BRASS FITTING.
CAST-IRON MAINS AND SPECIALS.

Further Particulars and Forms of Tender may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed and endorsed Tenders must be delivered to the undersigned not later than the 27th of May, 1904.

The lowest or any Tender not necessarily accepted.

By order,
WILLIAM P. HALLIWELL,
Town Clerk.

Town Clerk's Office,
Darwen, April 26, 1904.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF COAL AND CANNEL.

THE Corporation are prepared to receive TENDERS, on forms to be obtained at the Office of the Gas and Water Manager, for the supply of screened GAS COAL and CANNEL for the Year ending the 30th of June, 1905.

Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Coal," to be delivered at the Town Clerk's Office, not later than Twelve o'clock noon on Wednesday, the 18th day of May, 1904.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

BOROUGH OF BARROW-IN-FURNESS.

SUPPLY OF GAS OIL.

THE Corporation are prepared to receive TENDERS for the supply of about 300 to 400 Tons of OIL, suitable for the manufacture of Carburetted Water Gas, delivered free at the Gas-Works Siding, in such quantities and at such times as may be required during the period ending the 30th of June, 1905.

Sealed Tenders, addressed to the Chairman of the Gas and Water Committee, and endorsed "Tender for Oil," to be delivered at the Town Clerk's Office, not later than Twelve o'clock noon on Wednesday, the 18th of May, 1904.

The lowest or any Tender not necessarily accepted.

By order,
C. F. PRESTON,
Town Clerk.

Town Hall, Barrow-in-Furness.

HAVERHILL URBAN DISTRICT COUNCIL.

TENDERS FOR COAL.

THE Haverhill Urban District Council invite TENDERS for the supply of 500, 1000, or 1500 Tons of best GAS COAL (Screened or Unscreened) to be delivered free at the Haverhill (G.E.R.) Station in such quantities and at such periods as may be ordered from time to time between the 1st day of June next and the 31st of May, 1905.

No Form of Tender is provided.

The Council do not bind themselves to accept the lowest or any Tender.

Tenders, endorsed "Gas," to be delivered to me on or before the 17th of May, 1904.

THOMAS BATES,
Clerk.

Haverhill, May 2, 1904.

BOROUGH OF BATLEY.

TENDERS FOR GAS COAL.

THE Corporation of Batley are prepared to receive TENDERS for the supply and delivery at the Gas-Works of 20,000 Tons of screened GAS COAL.

Conditions and Forms of Tender may be obtained on application to the Manager of the Gas-Works.

Sealed Tenders, addressed to me and endorsed "Gas COAL," to be delivered at my Office by noon on Wednesday, the 18th of May prox.

The Corporation do not bind themselves to accept the lowest or any Tender, and may accept any Tender for a part only of the specified quantity.

By order,
JOSEPH HANSON CRAIK,
Town Clerk.

Town Clerk's Office,
Batley, April 30, 1904.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the supply of about 4000 Tons of GAS COAL (screened or unscreened), and 1000 Tons of CANNEL, for the Year ending June 30, 1905.

Tenders, endorsed "Gas Coal," to be delivered to W. H. Welsh, Esq., 52, Brown Street, Manchester, not later than Ten a.m. on Tuesday, the 10th day of May, 1904.

Forms of Tender may be had on application to the undersigned.

The Directors do not bind themselves to accept the lowest or any Tender.

WM. SEVERS,
Engineer and Manager.

Gas-Works, Wilmslow,
April 23, 1904.

WILMSLOW AND ALDERLEY EDGE GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for their requirements as under for the Year ending June 30, 1905.

GAS-METERS (dry), GAS-COOKERS, PAINT, OIL, and BENZOL, delivered at the Company's Works.

Also for CARTING for One, Two, or Three Years.

Particulars as to Quantities required. Copies of Specification, and Forms of Tender, can be had from the undersigned.

Tenders, endorsed "Tender for ———," must be delivered to W. H. Welsh, Esq., Secretary, 52, Brown Street, Manchester, not later than noon on Tuesday, the 10th day of May, 1904.

The Directors do not bind themselves to accept the lowest or any Tender.

WM. SEVERS,
Engineer and Manager.

Gas-Works, Wilmslow,
April 23, 1904.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Corporation of Birkenhead are prepared to receive TENDERS for the supply of COAL, COAL NUTS, and THROUGH and THROUGH CANNEL for Gas-Making Purposes, for a period of Twelve Months, commencing from the 1st of July, 1904.

Forms of Tender, together with any further Information, may be obtained from Mr. T. O. Paterson, C.E., Gas Engineer, Gas-Works, Birkenhead.

Tenders (accompanied by copy of recent analysis), stating the price per ton delivered on to the Gas-Works Railway Siding, must be sent in to me, sealed and endorsed "Tender for Gas-Works Coal," not later than Five o'clock in the Afternoon of Thursday, the 19 h of May, 1904.

Also for the supply of STEAM COAL and SLACK (washed and unwashed) to be delivered at the Pumping-Stations of the Spring Hill, Playbrick Hill, Borough Road, Mount Road, and the Ford Water-Works, for a period of Twelve Months, commencing from the 1st of July, 1904.

Forms of Tender, together with any further Information, may be obtained from Mr. J. W. M. Richardson, C.E., Assistant Water Engineer, 52, Balls Road, Birkenhead.

Tenders, stating the price per ton delivered at the various Pumping-Stations, must be sent in to me, sealed and endorsed "Tender for Water-Works Coal," not later than Five o'clock in the Afternoon of Thursday, the 19th of May, 1904.

All deliveries to be made from time to time according to the requirements of the respective Engineers.

The parties whose Tenders may be accepted will be required to enter into a contract containing a clause as to the payment of the rate of wages, and the observance of the hours of labour recognized and agreed upon between the Trades' Unions and the Employers in the locality in which the work for carrying out the Contract is to be performed.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
ALFRED GILL,
Town Clerk.

Town Hall, Birkenhead,
April 27, 1904.

LEIGH-ON-SEA URBAN DISTRICT COUNCIL.

THE Leigh-on-Sea Urban District Council invite TENDERS for the supply of 800 Tons of good GAS COAL, to be delivered at the Gas-Works Wharf, Leigh-on-Sea, as required, in quantities of not more than 80 Tons.

Sealed Tenders, endorsed "Tender for Coal," must be received by me not later than Monday, the 16th day of May next.

The Council do not bind themselves to accept the lowest or any Tender.

ALFRED J. ARTHY,
Clerk to the Council.

Council Offices, Leigh-on-Sea,
April 29, 1904.

DEVONPORT CORPORATION.

(GAS DEPARTMENT.)

THE Gas Committee of the Devonport Corporation are prepared to receive TENDERS for the supply of 35,000 Tons of Durham GAS COAL, to be delivered during the Year ending the 30th of June, 1905.

The Coal is to be delivered c.i.f. at Tamar Wharf, Devonport; and Forms of Tender and Specification may be obtained from the undersigned.

Sealed Tenders, endorsed "Tenders for Coal," and addressed to R. J. Fittall, Esq., Town Clerk, Devonport, are to be delivered at the Town Clerk's Office, on or before the 25th day of May, 1904.

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

CROMER, NORFOLK.

TENDERS FOR COAL.

THE Directors of the Cromer Gas Com- pany are prepared to receive TENDERS, from Colliery Proprietors only, for the supply of about 2500 Tons of first-class GAS COAL, to be delivered at the Company's Siding, Midland and Great Northern Railway Station, Cromer, between the 1st of July next and the 20th of June, 1905. Weight given to be stated.

Deliveries to be made in such quantities and at such times as may be required by the Company.

Payment, net cash monthly.

Sealed Tenders, endorsed "Tender for Coal," to be sent to the undersigned on or before the 9th day of May next.

Forms of Tender are not supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
P. E. HANSELL,
Secretary.

Cromer, April 28, 1904.

BOROUGH OF BURTON-UPON-TRENT.

THE Gas Committee invite Tenders for:—

GAS COAL.

The supply of 32,000 Tons of best screened GAS COAL and 3000 Tons of CANNEL, to be delivered in Sender's or Railway Company's Waggons at the Gas-Works during the Twelve Months ending June 30, 1905, in accordance with the Form of Tender and Conditions which may be obtained from the undersigned.

Intending Contractors must state in their Tender what allowance they will make from the tendered price if the Coal is carried in the Gas Committee's Waggons.

LIME.

The supply of about 300 Tons best Hand-Picked LIME for Purifying to be delivered in Sender's or Railway Company's Waggons at the Gas-Works in such quantities and at such times as may be required during the Twelve Months ending June 30, 1905.

TAR.

The purchase of the surplus TAR which will be produced and delivered into the Purchaser's Tank-Waggons at the Gas-Works during the Twelve Months ending June 30, 1905.

Terms of Payment, Net Cash Monthly.

Tenders, endorsed "Coal," "Lime," and "Tar" respectively, are to be delivered to the undersigned on or before Wednesday, the 18th day of May, 1904.

The Committee do not bind themselves to accept any Tender.

F. L. RAMSDEN,
Manager and Engineer.

The Gas-Works, Burton-upon-Trent,
May 2, 1904.

BOROUGH OF RICHMOND (SURREY) WATER-WORKS AND PUBLIC BATHS.

TENDERS FOR SMOKELESS WELSH STEAM COAL.

THE Town Council of the Borough of Richmond (Surrey) invite TENDERS for the supply of about 1450 Tons of best WELSH SMOKELESS COAL, to be delivered in barges of about 40 Tons alongside the Wharf opposite the Water-Works, Richmond, for One Year from the 1st day of July, 1904, and the 30th day of June, 1905.

The seam and district from which the Coal is to be supplied must be stated in the Tender.

Particulars and Forms of Tenders can be obtained of Mr. W. G. Peirce, Borough Water-Works Engineer, at the Water-Works.

No Tender will be recognized unless it is made on the prescribed Form, properly filled up in every respect; and no expenses or claim will be allowed or paid to any person whether tendering or not.

The security stipulated by the Public Health Act, 1875, for the due performance of the contract will be required, and the Contract and Bond will be prepared by the Town Clerk.

Sealed Tenders, endorsed "Tenders for Welsh Coal," and addressed to the Chairman of the Water Committee, Borough of Richmond (Surrey), must be delivered at the Town Clerk's Office by Ten o'clock on Monday, the 30th of May, 1904.

The Council do not bind themselves to accept the lowest or any Tender.

FREDK. B. SENIOR,
Town Clerk.

Town Clerk's Office,
Town Hall, Richmond (Surrey).

BRENTWOOD GAS, COKE, AND LIGHT COMPANY, LIMITED.

SULPHURIC ACID.

THE Directors are prepared to receive TENDERS for the supply of SULPHURIC ACID to the 30th of June next.

Delivery to be free in Tank-Waggons to Brentwood Station (G.E.R.) of 80 per cent. real acid.

Offers to be made for supplying either Brimstone (free from arsenic) or Pyrites Acid.

The lowest or any Tender not necessarily accepted.

All Tenders, marked "Acid," to be delivered to the undersigned not later than the 10th prox.

C. A. FIELDER,
Secretary.

Gas Offices, Brentwood,
Essex, April 29, 1904.

PRIMITIVA GAS AND ELECTRIC LIGHTING COMPANY OF BUENOS AIRES, LIMITED.

THE Directors of the above-mentioned Company are prepared to receive TENDERS for 36,000 Tons of Best Screened GAS COAL of the Yorkshire or Durham varieties, to be delivered, f.o.b., in the course of Twelve Months, more or less, commencing the 1st of August next.

Sealed Tenders to be addressed to the Chairman of the Company, endorsed "Tender for Coal," at the Company's Offices, 2, Bank Buildings, Princes Street, E.C.

The Directors do not bind themselves to accept the lowest or any Tender.

J. H. BOUWER,
Secretary.

Offices of the Company:
2, Bank Buildings, Princes Street, E.C.

COUNTY BOROUGH OF SALFORD.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply and erection of COKE-CONVEYING MACHINERY AND COKE-STORAGE HOPPERS required at their Liverpool Street Works.

The Drawings may be seen, and Copies of the Specification and Form of Tender obtained (for which a charge of £1 1s. will be made, to be returned on receipt of a *bonâ-fide* Tender), on application to Mr. William W. Woodward, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Coke-Conveying Machinery, &c.," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Wednesday, the 18th of May, 1904.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
April 29, 1904.

BOROUGH OF BRIDGNORTH.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for ALTERATION of RETORT-HOUSE, and erection (complete with Ironwork) of Three Beds of Six RETORTS, with CHIMNEY, &c.

Plans and Specification can be seen at the Gas-Works, Bridgnorth, or at the Office of Mr. W. Belton, Gas-Works, Shrewsbury, from whom any further Information can be obtained.

Sealed Tenders to be sent to the undersigned not later than the 14th of May, 1904, endorsed "Tender for Retorts, &c."

Neither the lowest nor any Tender will necessarily be accepted.

By order,
J. H. COOKSEY,
Secretary.
Town Clerk.

Bridgnorth, Shropshire,
April 28, 1904.

LIVERPOOL UNITED GASLIGHT COMPANY.

TENDERS FOR CANNEL AND COAL.

THE Directors of the Liverpool United Gaslight Company are prepared to receive TENDERS for the supply of 70,000 Tons of CANNEL, and 220,000 Tons of COAL, to be delivered at the various Works of the Company during the period of Twelve Months, between the 1st of July, 1904, and the 30th of June, 1905.

Tenders will be received for the whole or any portion of the above quantity.

The Directors reserve the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Full Particulars and printed Forms of Tender can be obtained on application to the undersigned, at the Gas Office, Duke Street, Liverpool, to whom Sealed Tenders (on the printed Form only) must be delivered, at or before Ten a.m. on Monday, May 16, endorsed "Tender for Cannel and Coal."

By order,
WILLIAM KING,
Engineer.

Gas Office, Duke Street,
Liverpool, April 13, 1904.

DEAL AND WALMER GAS COMPANY.

ISSUE OF £4700 NEW STOCK.

THE Directors invite Tenders for the purchase of this STOCK, which is entitled to a Maximum Dividend of £5 per cent. per annum.

The paid-up Capital of the Company in Shares and Stock is £36,050.

The full authorized dividends have been regularly paid for the last Twenty Years, with the exception of one Half Year, when 1 per cent. less than the maximum of 10 per cent. was paid on the "A" Shares.

The net profits of the last Half Year were £2871; and the consumption of gas has nearly doubled in Ten Years. Large reserve fund.

Particulars and Forms of Tender (to be sent in by the 24th of May, 1904) can be had of the SECRETARY, Queen Street, DEAL.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

LEA BRIDGE DISTRICT GAS COMPANY.

NEW ISSUE OF £10,000 CONSOLIDATED ORDINARY STOCK AND £2000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

SWANAGE GAS AND WATER COMPANY.

NEW ISSUE OF £2500 FOUR-AND-A-HALF PER CENT. PREFERENCE "GAS" STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION at the Mart, E.C., on Tuesday, May 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY.

NEW ISSUE OF £5000 CONSOLIDATED ORDINARY STOCK AND £1000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GREAT YARMOUTH WATER-WORKS COMPANY.

SALE BY AUCTION OF 500 £10 ORDINARY SHARES,

Ranking for 7 per cent. Dividend, 4 per cent. having been paid on Similar Shares in the Company for 8 years' past.

The Company was Incorporated Fifty Years ago for supplying the important Seaport Town of Great Yarmouth and the surrounding Districts; and to keep pace with the increasing demand for Water, this further Capital for the construction of New Works is required. The water-revenue has risen from £14,226 in 1897 to £19,344 last year.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 17, at Two o'clock, in Lots, by order of the Directors.

Particulars of Sale, with Form of Instructions for the Auctioneer or Secretary to purchase for Investors unable to attend the Auction, obtainable, post free of the SECRETARY of the Company, GREAT YARMOUTH, or of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By Order of the Directors of the

SOUTHEND WATER-WORKS COMPANY.

NEW ISSUE OF £15,900 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the MART, E.C., on Tuesday, May 17, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Mrs. M. A. Lester, deceased, and another.

GAS AND WATER STOCKS

IN THE

SOUTH ESSEX WATER COMPANY, and HORNSEY GAS COMPANY.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, May 17, at 2 o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

LAMBETH WATER-WORKS COMPANY.

NOTICE is Hereby Given, that it is the intention of the Company to SELL BY TENDER £70,000 OF THREE PER CENT. DEBENTURE STOCK, redeemable at par, at the option of the Company (or their successors), on six months' notice at any time after the expiration of 25 Years from the date of issue.

Particulars, Conditions of Sale, and Forms of Tender may be obtained at the Company's Office, Brixton Hill, S.W.

Sealed Tenders are to be delivered at the said Office not later than Twelve o'clock noon on Monday, the 9th day of May, 1904

H. WILKINS,
Secretary.

Brixton Hill, S.W., March 29, 1904.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

SOUTH STAFFORDSHIRE WATER-WORKS COMPANY.

TENDERS FOR ENGINE SLACK.

THE Company are prepared to receive TENDERS for the supply of ENGINE SLACK, at their various Pumping-Stations, for Twelve Months from the 1st of July, 1904.

Forms of Tender, giving Particulars as to the quantity of Coal to be delivered at the various Stations, can be obtained on application to me.

Tenders, made out on the Forms provided, and endorsed "Tenders for Slack," must reach me at latest by Twelve noon on Monday, the 16th of May, 1904.

H. ASHTON HILL, M.Inst.C.E.,
Engineer.

Paradise Street,
Birmingham.

ROMFORD GAS AND COKE COMPANY, LIMITED.

THE Directors of the Romford Gas and Coke Company, Limited, invite TENDERS for the supply of 6000 Tons of Best DURHAM GAS COALS to be delivered free on the Company's Siding, Romford Station, G.E. Railway, in Monthly quantities over a period of Twelve Months, commencing July, 1904.

Payment will only be made for the weight of Coal delivered over the Company's Weighbridge.

Tenders to be addressed to Jos. Smith, Esq., Chairman of the Company, endorsed "Tender for Coals," and sent in before noon on Thursday, May 12 inst.

The Directors do not bind themselves to accept the lowest or any Tender.

Schedule of deliveries may be obtained on application.

W. D. CHILD,
Engineer and Manager.

Works and Office: Nursery Walk,
Romford, April 30, 1904,

CANTERBURY GAS AND WATER ACT, 1890.

SALE OF NEW "A" AND "B" STOCKS

IN THE

CANTERBURY GAS AND WATER COMPANY.

MR. FRANK AMOS is instructed by the Directors to SELL BY AUCTION, at the Mart, St. Margaret's Street, Canterbury, on Wednesday, May 18, 1904, at Three o'clock p.m. precisely.

£2500 NEW "A" AND "B" STOCKS

IN THE

CANTERBURY GAS AND WATER COMPANY

in 250 Lots of £10 each, authorized by the above-named Act.

Particulars and Conditions of Sale may be obtained of the Secretary, at the Offices of the Company, Castle Street, Canterbury, or of MR. FRANK AMOS, F.S.I., 3, The Parade, CANTERBURY.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams: "DARWINIAN, MANCHESTER."
Telephone 1806.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas.

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

RAILS.

New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

B. M. RENTON,
MIDLAND WORKS,
SHEFFIELD.

'THE LAST WORD IN LIGHTING.'

ON DEC. 8 OF LAST YEAR,

Prof. Drehschmidt's article, with Tables and Diagrams, showing the advantages of the **MILLENNIUM SYSTEM** over Intensified Gas and Electric Arc appeared in this "JOURNAL."

Those statements have been verified by all the leading authorities in Europe.

The MILLENNIUM SYSTEM has been adopted by Berlin, "The Best Lighted City," at a preliminary cost of 1,000,000 marks.

Nearly every important City and Town on the Continent has adopted the system.

Since the article

APPEARED IN THIS JOURNAL

we have been flooded with Inquiries for Particulars for Public Lighting.

Among other Installations, **WE HAVE LIGHTED**:—

Ellins & Son's Market, Leeds. **Graham's Stores, Fence Houses.**
Tynemouth Gas Offices. **Joures & Maltman's, South Shields.**
Bentley & Jackson's, Bury. **Imperial Stove Co., Leamington.**
Peers' Court of the Houses of Parliament.
Dent-Allcroft's Glove Warehouses, London; Aylesbury Town Hall, Market, and Public Offices,

and have been unanimously requested by the Council to take over the Public Lighting of the Town. **Millbay Docks and Harbour for the Great Western Railway Company.**

We are lighting Raglan Barracks, Devonport, for the War Office; putting up an Installation for the City of London Corporation, and contracting for the lighting of many towns under our System.

THIS IS WHAT WE GUARANTEE:

50 per cent. cheaper than Incandescent Gas.
70 ,, ,, ,, Electric Arc.
80 ,, ,, ,, Electric Incandescent.

600 per cent. more light than ordinary fish-tails at **HALF THE COST.**

IF YOU WANT MORE LIGHT,
IF YOU DESIRE TO REDUCE YOUR COSTS,
IF YOU WANT TO CUT AGAINST ELECTRIC LIGHTING,
COMMUNICATE WITH US.

We have hundreds of Installations running; and we have never had a failure, and never a complaint.

THE BRITISH COMPRESSED GAS COMPANY,
57, Barbican, LONDON, E.C.

TROTTER, HAINES, & CORBETT, LIMITED,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
Shipments Promptly and Carefully Executed.

London Office: R. Cull, 34, Old Broad Street, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THE
PETROLEUM GAS SYNDICATE
Supply and erect Complete Installations of their
PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

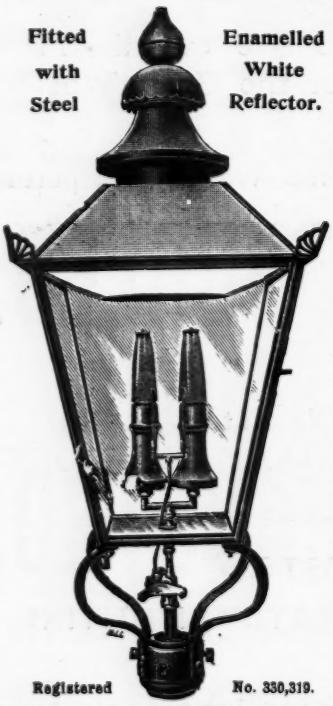
PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.
The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: 28, Victoria St., Westminster.
Works: 10, Rochester Row, S.W.

THE
"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



Registered No. 330,319.

The "Kilburn" Lantern (for double lights) and the "St. Albans" Lantern have been adopted for lighting the Town of St. Helens.

H. GREENE & SONS, Limited,
Surrey Engineering Works,
Blackfriars Road, LONDON.
Telephone 1693 HOP.
Telegrams: "LUMINOSITY LONDON."

SAVE MONEY LABOUR

Imperial Cookers give no trouble, and for quality and cheapness cannot be excelled.

TWO GOLD MEDALS
in Six Months.

Our Gas-Cooker Orders last Year were

455 % (per cent.)

more than in 1902.

THE IMPERIAL STOVE CO.,
LEAMINGTON SPA.
Telegrams: "*Imperial, Leamington.*"
Telephone: One X.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

UNEQUALLED.
Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

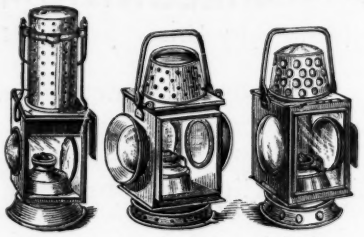
JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
Note.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

THOMAS TURTON AND SONS, Limited,
SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
London Office:
90, CANNON STREET, E.C.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.
For Particulars, Price, &c., apply to Mr. EDWARD PRICE, "Langley," Wyke Avenue, WORTHING.

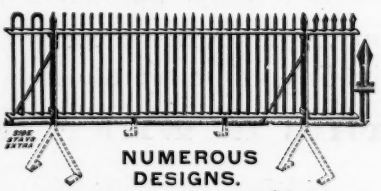
ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.
43, Manchester Street, Gray's Inn Road, W.C.

THE
"ROTARY" STATION METER.
Efficiency Demonstrated.
APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

BAYLISS,
JONES,
AND
BAYLISS
LIMITED,
Manufacturers of
IRON RAILING &c.



NUMEROUS DESIGNS.

COKE-BARROWS.

LISTS FREE.
BAYLISS, JONES & BAYLISS.
WOLVERHAMPTON,
And 139 & 141, Cannon St., London, E.C.

COAL TAR PRODUCTS.

Benzol, Toluol, Solvent Naphtha, Creosote Oils, Grease Oils, Carbolic Acid, Crude Creosote Salts, Granulated (Crude) Naphthalene, Sublimed Naphthalene, Anthracene, Refined Tar, Pitch, also Sulphate of Ammonia.

For Prices apply to the **SOUTH METROPOLITAN GAS COMPANY,**

Works: ORDNANCE WHARF, EAST GREENWICH, LONDON, S.E.

709, OLD KENT ROAD, LONDON, S.E.

Telegraphic Address: "METROGAS, LONDON."

JÄGER'S PATENT GRIDS.

CAPACITY OF PURIFIERS DOUBLED.

PRESSURE CONSIDERABLY REDUCED.

OXIDE THOROUGHLY EXHAUSTED.

APPLICABLE TO EVERY KIND OF PURIFIER.

SAML. CUTLER & SONS, MILLWALL, LONDON, E.,

SOLE LICENSEES AND MANUFACTURERS

For the United Kingdom, the Colonies, and some other Countries.

No. 158.

Wrought-Iron

And Fittings & Accessories.

LAMBERT BROS., WALSALL,

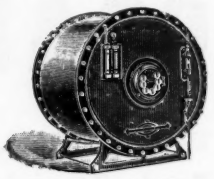
MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM.
BRASS GAS-FITTINGS GAS-VALVES STEAM & WATER VALVES TOOLS. &c. AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., LTD., 91 & 93, SOUTHWARK ST., S.E.

GASHOLDER PAINT SPECIALISTS.

"OUR AIM IS QUALITY."
TO BUY THE PUREST IS THE BEST AND MOST SATISFACTORY.
ALL PAINTS GUARANTEED TO BE GROUND IN PURE LINSEED OIL.
ARCHD. H. HAMILTON & CO., POSSILPARK PAINT WORKS, GLASGOW.
TELEGRAMS: "SATISFY."

JAMES MILNE & SON, LTD.,

GAS ENGINEERS
MILTON HOUSE WORKS EDINBURGH.
LONDON. —— LEEDS. —— GLASGOW.

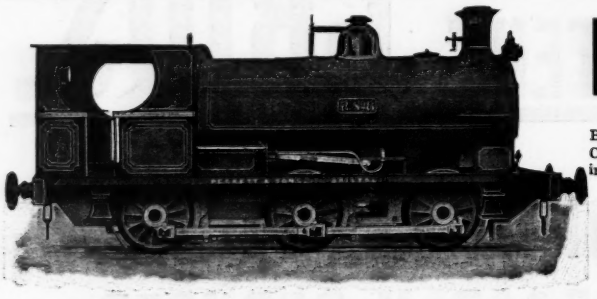


THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

MIDLAND AND WEST OF ENGLAND DISTRICT OFFICE: *6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.*
Telegraphic Address "WIGAN, BIRMINGHAM." Telephone No. 200.

LONDON DISTRICT OFFICE: *6, STRAND, LONDON—C. PARKER & SON, Sole Agents.*
Telegraphic Address: "PARKER LONDON."



LOCOMOTIVES

LOCOMOTIVES of all Sizes and Gauges specially constructed for Main and Branch Lines, Contractors, Docks, Gas-Works, Collieries, Iron-Works, Brick and Cement Works, &c. Locomotives of various Sizes always in Stock, ready for immediate Delivery.

Photographs, Specifications, and Prices on Application.

PECKETT & SONS, Atlas Locomotive Works, **BRISTOL.**

Telegraphic Address: "PECKETT, BRISTOL."

GAS ENGINEERS.

CONTRACTORS FOR, AND ERECTORS OF, ALL GAS-WORKS PLANT.

REGENERATORS, GENERATORS, AND DIRECT-FIRED RETORTS.

RESULTS GUARANTEED.

COMPLETE INSTALLATIONS OF HORIZONTAL AND INCLINED RETORTS

ADDRESS—

NEWTON CHAMBERS, CANNON ST., **BIRMINGHAM.**

EVERY Gas Manager aims at having the Highest Make of Gas per Ton of Coal, and Highest Make per Mouthpiece, with Minimum Consumption of Fuel.

These results can be accomplished only by adopting the most efficient and up-to-date Settings.

HISLOP'S RETORT-SETTINGS

Secure the highest possible results of Working.

RETORT-BENCHES ERECTED COMPLETE ON STAGE, SHALLOW, OR EXTRA SHALLOW CHAMBER PLANS.

Results Guaranteed.

R. & G. HISLOP,

Gas Engineers and Contractors, 13, ST. JAMES PLACE, PAISLEY.

LONDON : 11, Queen Victoria Street, E.C.—Messrs. J. Moon & Co.

THE DELLWIK-FLEISCHER WATER-GAS PROCESS

For Increasing the Capacity of Coal-Gas Works, also for Incandescent Lighting, Driving of Gas-Engines, & Manufacturing Purposes.

(PATENTS IN ALL COUNTRIES)

THIS PROCESS HAS BEEN ADOPTED AT THE FOLLOWING GAS-WORKS:—

IN ENGLAND: WEST BROMWICH, ILFORD, TIPTON, CLEETHORPES, BILSTON, RUSHDEN & HIGHAM FERRERS.

IN THE COLONIES: CAPE TOWN.

ON THE CONTINENT: KÖNIGSBERG, ERFURT, ISERLOHN, REMSCHEID, PFORTZHEIM, PLAUEN, BARMEN-RITTERSHAUSEN, NUREMBERG, MÜLHEIM A/RUHR, LUDWIGSHAFEN a/R., GÜSTROW, DORTMUND, SALZWEDEL, STUTTGART, BERLIN-MARIENDORF, BERNE, LYONS, GIJON, ROME, ARNHEIM, BRUMMEN,* OSTERFELD,* WARSTEIN,* WIBORG.*

[* Blue Water Gas with Incandescent Burners.]

ALSO FORTY INSTALLATIONS FOR MANUFACTURING PURPOSES.

THE DELLWIK-FLEISCHER WATER-GAS SYNDICATE,

25, VICTORIA STREET, WESTMINSTER, LONDON, S.W.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

TRADE MARK "SILICA."

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

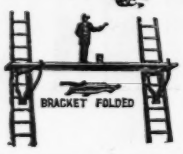
LADDERS. LADDERS. LADDERS.

WE ARE THE LARGEST MAKERS IN THE WORLD.

HEATHMAN & CO.,
PARSON'S GREEN, FULHAM, LONDON, S.W.

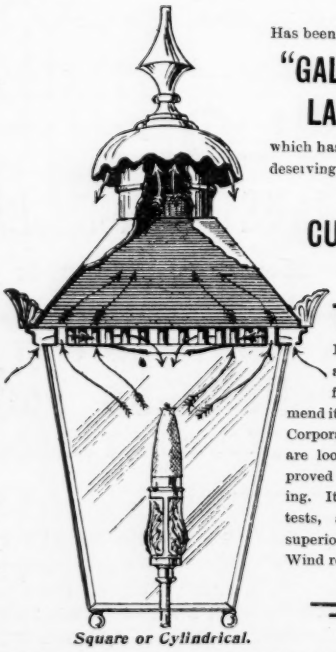
ADJUSTABLE AND PLAIN LADDERS, TRESTLES & STEPS.
Also TRUCKS & BARROWS.

A Stock kept at 37, Endell Street, Covent Garden, London, W.C.



A REVOLUTION IN STREET LIGHTING

Dust, Gale, and Insect Proof. Regenerating and Self-Intensifying.



Square or Cylindrical.

Has been caused by our

"GALEPROOF" LANTERN,

which has already achieved deserving popularity.

As a

CURE FOR "WIND" TROUBLES

It is unrivalled; and we can confidently recommend it to Gas Managers, Corporations, &c., who are looking for an Improved System of Lighting. It has stood severe tests, and proved its superiority in Light and Wind resistance.

PATENTEES AND MANUFACTURERS OF THE

'Wis' High-Power Lamp, 'Pond' Patent Arc Lamp, &c.

62, FARRINGDON STREET, **POND & CO.,** LONDON, E.C.

Fcap. Fol., 28 pp., 2 Plates, and 43 Illustrations, Bound in Duplex Paper Cover Price 2s. 6d. net, post free.

A DESCRIPTION OF THE

ZURICH NEW GAS-WORKS.

By A. WEISS, Engineer of the Works.
Translated from the German for, and Reprinted from, the "JOURNAL."

London: WALTER KING, 11, Bolt Court Fleet St., E.C.

HARPER & MOORES, Limited, STOURBRIDGE.

MANUFACTURERS OF

GAS-RETORTS,

Inclined, Horizontal, and Segmental.

Fire-Bricks, Fire-Clay Lumps, and Tiles

OF EVERY DESCRIPTION.

Also Manufacturers of **Cast-Iron Retorts, Iron Mouthpieces, Pipes, and all necessaries for Gas-Works requirements.**

Telegraphic Address: "MOORES, LYE." Telephone No. 23 Lye.

THE LEEDS FIRECLAY CO., LTD.

JOSEPH CLIFF & SONS' BRANCH.

Cliff's Wortley Silica Bricks.

FOR Arches and Crowns where high heats are required. They contain over 90 per cent. of Silica, and are nearly stationary under the influence of heat, swelling a little rather than contracting. They are not like a Gannister or Dinas Brick, but a Fire-Brick of a highly Silicious nature.

Cliff's Wortley Aluminous Bricks.

THESE are for Side Walls where great wear and tear takes place. Are made of a specially prepared mixture, are high in Alumina, and are what is termed a HARD FIRE-BRICK.

BALTIC WHARF, WATERLOO BRIDGE, LONDON, S.E.
Liverpool: Leeds Street. Leeds: Queen Street.

Telephone No. 756 Bank. *Telegrams: "Robustness, London."*

Please Note **CHANGE OF OFFICES** from Rooms 388 to 390 Second Floor, to **ROOMS 279, 279a, 280, 281, & 282 FIRST FLOOR**

MANSION HOUSE CHAMBERS, LONDON, E.C.

INCLINES, HORIZONTAL, FLOOR LEVELS, GENERATORS, AND REGENERATORS.

HIGH-CLASS

RETORT WORK

GUARANTEED.

GENERAL GAS AND WATER WORKS CONSTRUCTORS.

MAINLAYING.

Plans & Particulars—**J. & H. ROBUS, Engineering Contractors,** LONDON & GORING.

WELSBACH KERN

THREE-BURNER HOT-PLATE.

Each Burner of Varying Power.

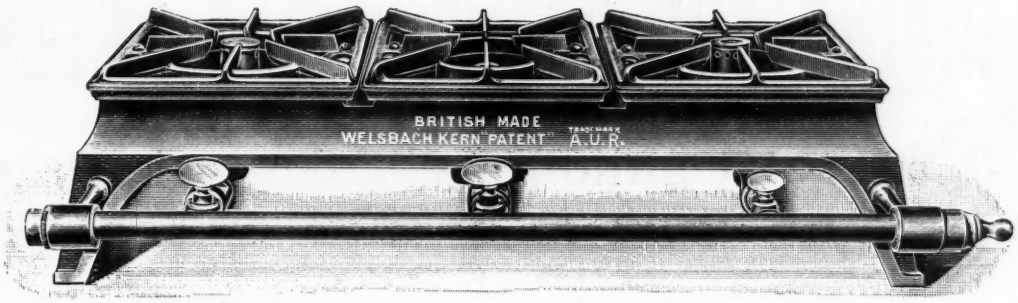
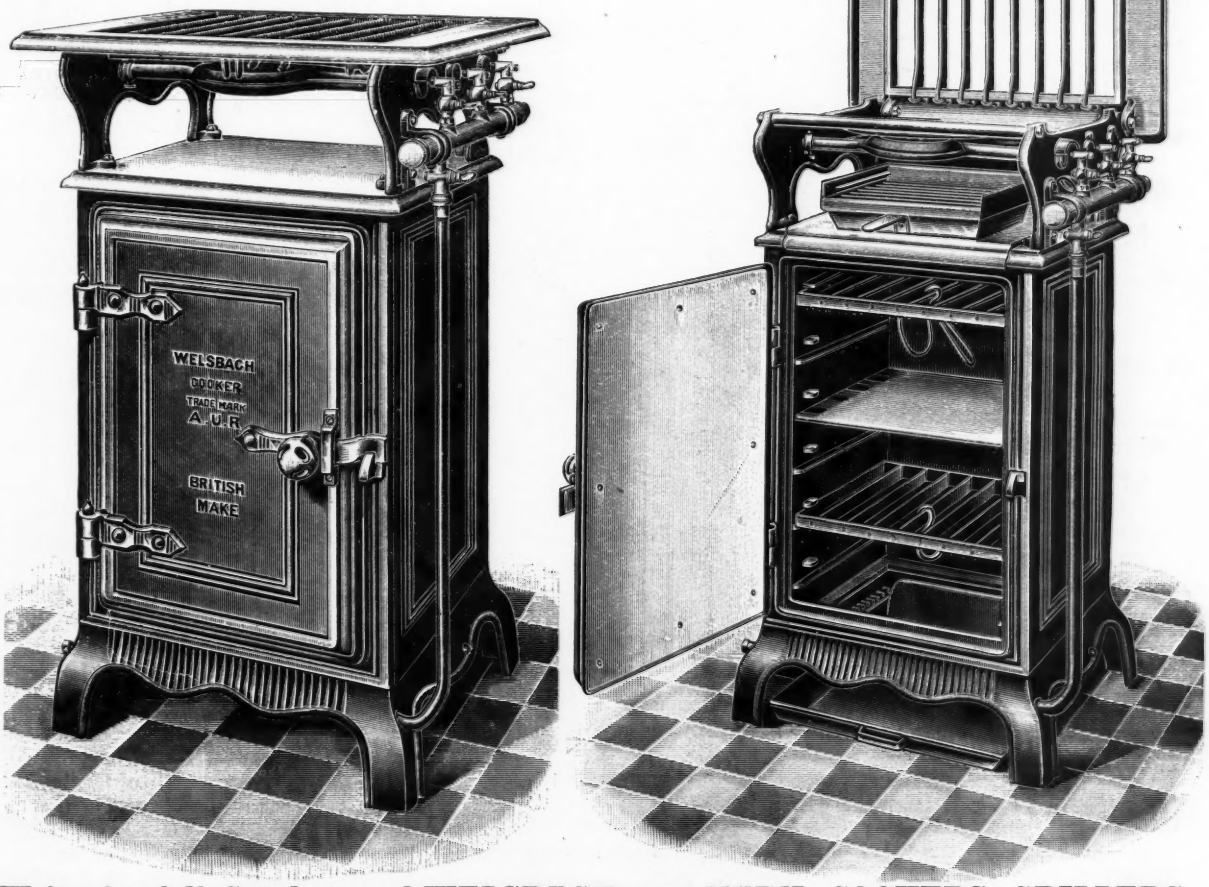


Fig. 2.—Open.

Fig. 1.—Closed.



Write for full Catalogue of WELSBACH and KERN COOKERS, GRILLERS, BOILERS, HOT-PLATES, IRONING-STOVES, &c.

THE WELSBACH INCANDESCENT GAS LIGHT CO., LTD.,

2-14, Palmer Street, Westminster, London, S.W.

Telegrams: "WELSBACH, LONDON." Telephone: 290 WESTMINSTER.

ARROL-FOULIS

PATENT HYDRAULIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,
DALMARNOCK IRON-WORKS, BRIDGETON,
GLASGOW.

LONDON ADDRESS: 32, VICTORIA STREET, WESTMINSTER, S.W.

PLANS AND ESTIMATES FURNISHED ON APPLICATION.

THE ARROL-FOULIS MACHINES Are Employed at the following Works—

GLASGOW GAS-WORKS—
Tradeston.
Dawsholm.
Dalmarnock.

GASLIGHT & COKE COMPANY—
Beckton.
Shoreditch.
Bromley.

SOUTH METROPOLITAN GAS COMPANY—
East Greenwich
Vauxhall.
Rotherhithe.

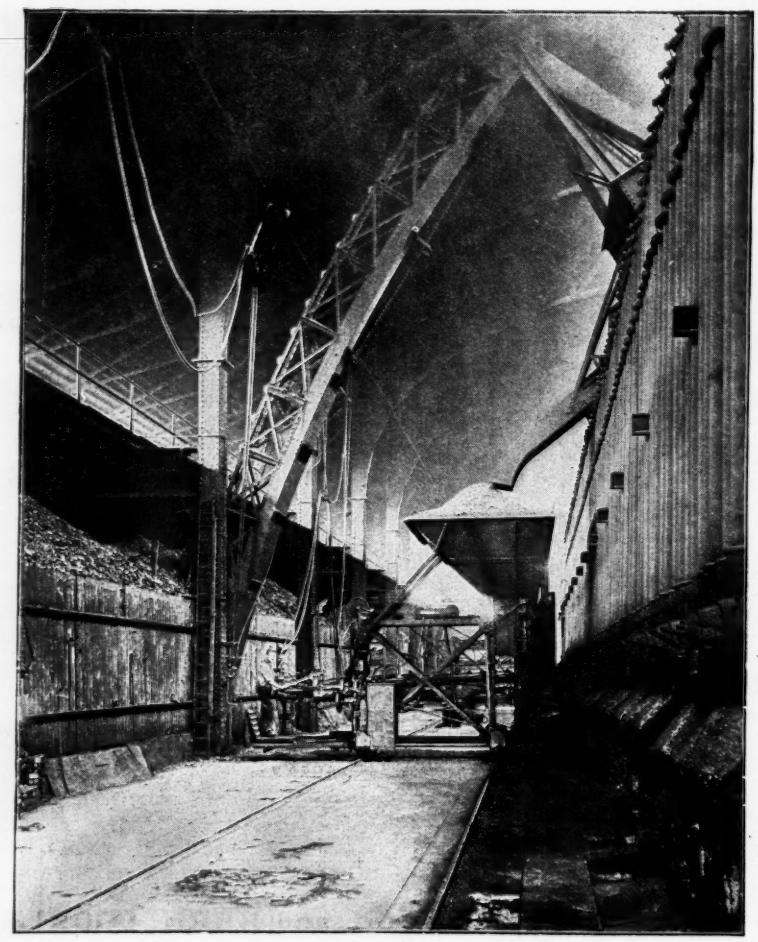
COMMERCIAL GAS-WORKS—
Wapping.
Poplar.

BROMLEY GAS-WORKS (KENT).

EDINBURGH GAS-WORKS.

LIVERPOOL GAS-WORKS.

BRIGHTON GAS-WORKS.



THE ARROL-FOULIS MACHINES Are Employed at the following Works—

LEEDS GAS-WORKS.

BIRMINGHAM GAS-WORKS.

BRITISH GAS CO.—
Hull.

BOLTON GAS-WORKS.

IMPERIAL CONTINENTAL GAS ASSOCIATION—
Amsterdam.
Vienna.
Berlin.

HAGUE CORPORATION GAS-WORKS—
Hague.

METROPOLITAN GAS-WORKS—
Melbourne.

CLEVELAND GAS-WORKS—
Cleveland, Ohio,
&c., &c., &c.

NEARLY 300 MACHINES ARE AT WORK OR IN COURSE OF CONSTRUCTION.

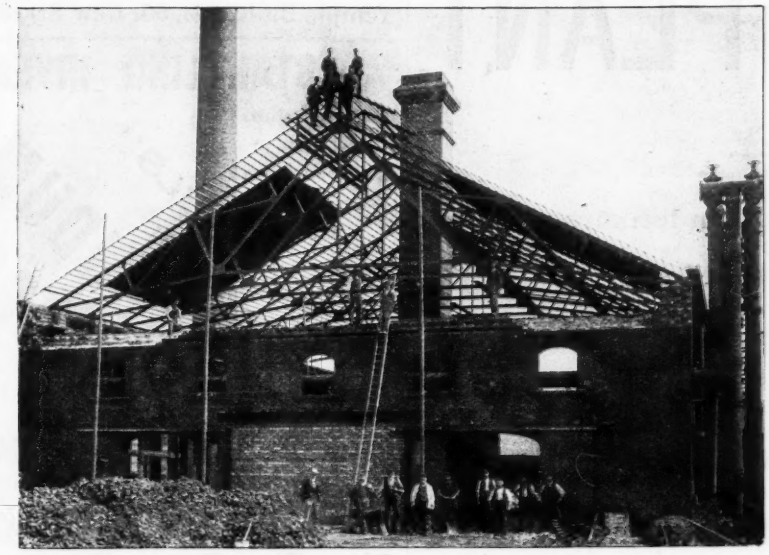
BECKTON GAS-WORKS.

THE TIME TAKEN TO DRAW AND CHARGE EACH RETORT BY THESE MACHINES AVERAGES

UNDER ONE MINUTE.

ELEVATING & CONVEYING

DRAKES *Telegrams: "Drakeson, Halifax."* **PLANTS** *Telephone: "No. 43 Halifax."* LIMITED



LONDON 18 & 19 QUEEN VICTORIA ST. E.C. **HALIFAX** NEW YORK 395 BROADWAY.

'STANDARD' PURIFYING GRIDS.

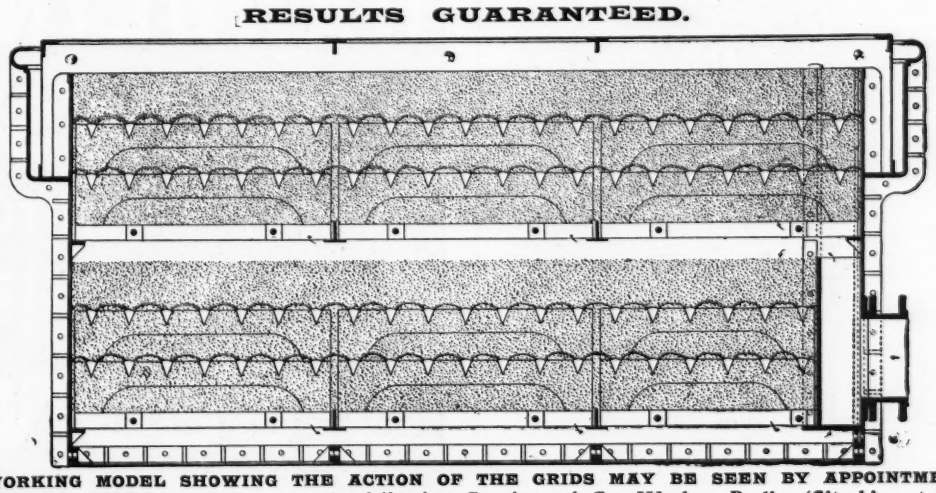
(F. D. MARSHALL'S PATENT.)

Orders received for fitting same to 112 Purifiers.

Increase the effective working capacity of the purifiers by 100 per cent.
Decrease the velocity of the gas by 50 per cent.
Decrease the Back-pressure by 50 per cent.
Decrease the cost of filling and emptying Purifiers and cleaning Grids by 30 per cent.

RESULTS GUARANTEED.

Can be fitted to any existing Purifiers without disturbance.



SUPERIOR to any other known form of Grids, British or Foreign.

A WORKING MODEL SHOWING THE ACTION OF THE GRIDS MAY BE SEEN BY APPOINTMENT.

The **"STANDARD" GRIDS** are in use at the following Continental Gas-Works: **Berlin (Gitschinerstrasse Works) Zurich, Cologne, Stuttgart, Frankfort, Baden, Münster, Ludwigshafen, Bamberg, Lichtenberg, Kiel, Salzwedel, Braunsweig, Schawb, Freiberg, Quedlinburg, Zehdenick, Neumünster, Braunsberg, Breslau, &c., &c., &c.**

Sole Manufacturers for Great Britain and Colonies:

KIRKHAM, HULETT, & CHANDLER, LD., PALACE CHAMBERS, BRIDGE ST. WESTMINSTER, S.W.

Telegraphic Address: "WASHER, LONDON." Telephone: No. 127 Victoria.

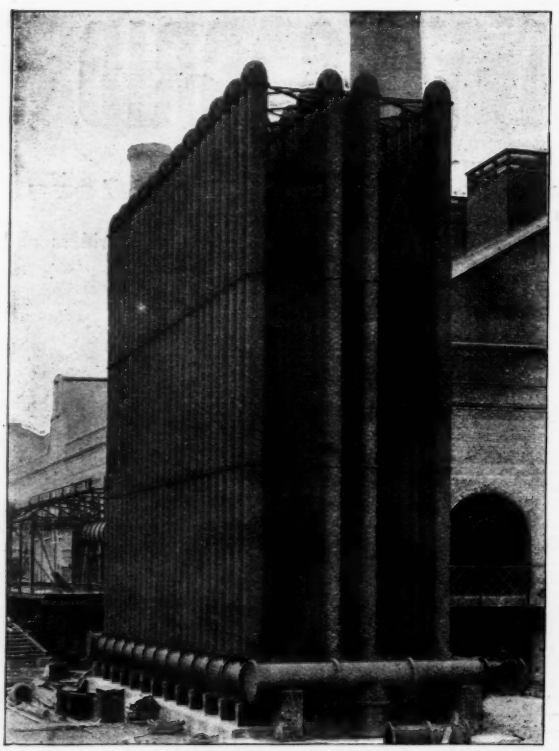
LARGE MAKERS
OF
GAS PLANT

ESPECIALLY

Water-Tube Condensers,
Washer-Scrubbers,
Retort-Bench Mountings,
Retort Mouthpieces,
Inclined or Horizontal,
Valves and Mains.

PURIFIERS WITH WATER OR DRY LUTES.

PATENT RUBBER JOINT AND FASTENINGS.



TWO like the above, supplied and erected, at the PROVAN GAS-WORKS, GLASGOW, by

CLAPHAM BROS. LTD.,

LONDON & KEIGHLEY, YORKS.

WILSON CARTER & PEARSON
LIMITED,

GAS COAL AND CANNEL FACTORS,

Supply to any Railway Station, or for Export, all kinds of Fuel for Gas and Other Purposes.

ADDRESS CHIEF OFFICES:

Temple Buildings, 50, New Street, Birmingham.

STARTLING INVENTION!

Carborundum Bricks, Carborundum Crucibles, &c.

DR. ENGELS' PATENT
CARBORUNDUM COATINGS

For Lining **GAS-GENERATORS.**

For Lining and Repairing **GAS-RETORTS.**

For Metallurgical and Chemical purposes, Furnaces, and Firing Plants of all kinds.

The Fire-Proof Products Co., Ld.

Representative: **Richard Cremer,**

CIVIL ENGINEER, WOODHOUSE LANE, LEEDS.

MECHANICAL COAL HANDLING PLANTS

OF ANY MAGNITUDE

MADE AND ERECTED BY

GIBBONS

BROTHERS LTD

DUDLEY & LONDON

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF
BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.
ESTABLISHED 1860.

CLAYTON SON & Co Ltd LEEDS
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD ALSO
THE ORIGINAL MAKERS OF
SPIRAL GUIDED GASHOLDERS
MAKERS OF ALL KINDS OF STRUCTURAL IRON & STEEL WORK. STEEL FRAMED BUILDINGS ROOFS RETORT FITTINGS PURIFIERS RETORT LIDS ANTIFREEZERS for Gasholders
STEEL TANKS
OF ALL SIZES
MAKERS OF THE LARGEST IN THE WORLD.
GASHOLDERS
OF EVERY DESCRIPTION & SIZE.
HIGH CLASS BOILERS FITTED WITH DEIGHTON'S PATENT CORRUGATED FLUES.
Telegrams GAS LEEDS. London Office 60 Queen Victoria St E.C.

MANNESMANN

LAMP POSTS
made throughout of
WELDLESS STEEL TUBING
including base, ring, and ladder rest.

Light, Strong, Unbreakable, and Cheap.

GAS, WATER, & STEAM TUBES AND FITTINGS.

WELDLESS STEEL SPIGOT & FAUCET PIPES
for Gas and Water Mains.

Tubes can be supplied up to 10 inches diameter and in lengths up to 30 feet.

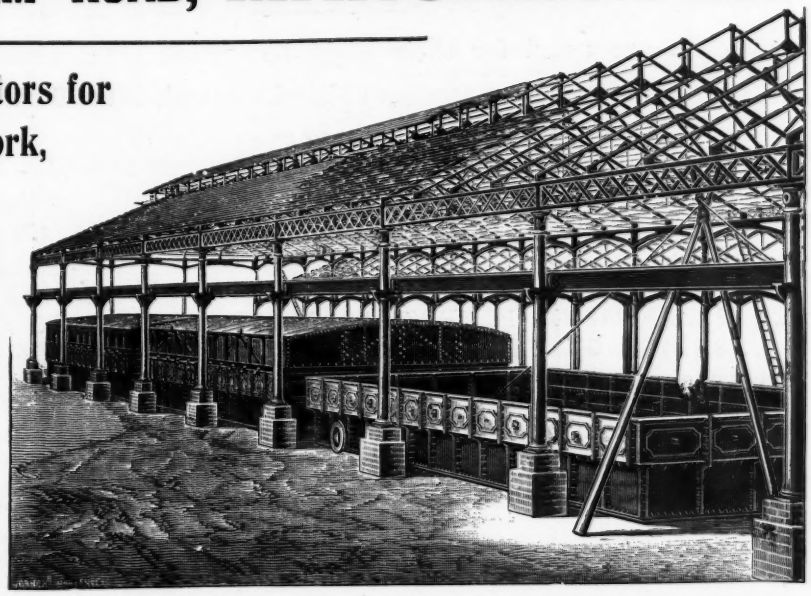
THE BRITISH MANNESMANN TUBE COMPANY, LTD.,
110, CANNON ST., LONDON, E.C.
Birmingham Depôt: Bridge Works, LISTER ST.
Works: LANDORE, SOUTH WALES.

R. & J. DEMPSTER, LTD.. GAS PLANT WORKS,
OLDHAM ROAD, MANCHESTER.

Telegraphic Address "SCRUBBER, MANCHESTER." National Telephone Nos. 54 and 2296.

Engineers and Contractors for Construction Ironwork,

ROOFS, GIRDERS, PURIFIERS, WASHERS, SCRUBBERS, CONDENSERS, GASHOLDERS, TANKS, RETORT-MOUNTINGS, VALVES, &c., &c.



Purifiers and Roofs erected at Windsor Street Works, Birmingham, to the Designs and under the supervision of C. HUNT, Esq., M.Inst.C.E.

London Office: 165, GRESHAM HOUSE, OLD BROAD STREET, E.C.

MOBBERLEY & PERRY,
STOURBRIDGE.

MANUFACTURE EVERY KIND OF FIRE-CLAY GOODS,

Inclined, Horizontal, and Segmental Retorts of Best Quality.

SPECIALS FOR WATER GAS PLANTS.

LARGE STOCKS KEPT.

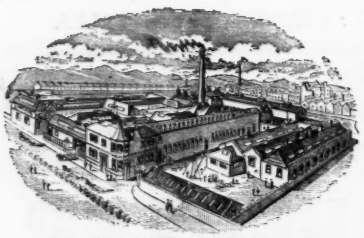
Established 1850.

ALDER & MACKAY,

MANUFACTURERS OF

WET AND DRY GAS-METERS

Combining all the Latest Improvements.



New Grange Works, Edinburgh.

DRY METERS.

DRY METERS IN BEST TINNED-PLATE CASES.

DRY METERS IN CAST-IRON CASES.

(We are the Original Designers and Makers of Cast-Iron Dry Meters.)

DRY PREPAYMENT METERS ARRANGED EITHER FOR PENNIES OR SHILLINGS.

DRY EXPERIMENTAL AND TEST METERS.

Our Meters are noted for their Rigid Exactitude of Measurement, Reliability under the Extremes of Working, with Great Durability.

WET METERS.

WET CONSUMERS' METERS.

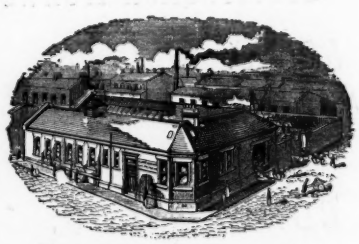
UNDERGROUND WET METERS FOR STREET-LAMPS OR OUTSIDE SERVICES.

(Dispensing with Footway Boxes or Special Lamp-Posts.)

WET PREPAYMENT METERS ARRANGED EITHER FOR PENNIES OR SHILLINGS.

WET STATION METERS IN SQUARE OR ROUND CASES.

WET EXPERIMENTAL AND TEST METERS.



Ventnor Street Works, Bradford.

Samples, Prices, and all Information on application.

NEW GRANGE WORKS,

EDINBURGH.

Telegraphic Address: "ALDER, EDINBURGH." Telephone No. 81 Western.

VENTNOR STREET WORKS,

BRADFORD.

Telegraphic Address: "ALDER, BRADFORD." Telephone No. 1222.

London Office: 13, VICTORIA STREET, WESTMINSTER, S.W.

Printed for WALTER KING by King, Sell, & Olding, Ltd.; and Published by him at 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, May 3, 1904.